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EXPERIMENT STATION RECORD.

Vol. 51. JULY, 1924. No. 1.

One of the earliest services attempted by the *Record* upon its establishment was a discussion each year of the acts making appropriations for the support of the Federal Department of Agriculture. This practice has been continued without interruption in the belief that the information thus afforded as to the financial resources and prospective development of the Department is a matter of general interest. Taken as a whole, these acts constitute a valuable source of advance information regarding the Department's activities, since they prescribe its future lines of work in considerable detail and often limit quite rigidly the scope and direction of its undertakings. When properly interpreted they also serve as a useful basis of comparison for a period of years, although for one reason or another it seldom happens that successive acts are directly comparable without more or less explanation.

The latest of these measures, signed by President Coolidge June 5, is no exception in this respect. While in general appearance it resembles its predecessors, there are many important deviations which render direct comparisons exceptionally difficult. Thus the appropriations in the act for 1924 aggregated $69,536,653, but these were supplemented by an allotment of $3,304,800 carried elsewhere for the payment of the so-called "$240 bonus" to most Federal employees with salaries not in excess of $2,500 per annum; a total of $12,220,000 for the continuing appropriations not requiring annual action by Congress, such as the $3,000,000 fund for the Federal meat inspection and $4,580,000 for extension work under the Smith-Lever Act; deficiency appropriations aggregating $1,185,646.93 authorized April 2, 1924, of which $1,000,000 was for the combating of foot-and-mouth disease; and a special appropriation, approved April 26, 1924, of $1,500,000 to combat foot-and-mouth and other contagious and infectious diseases during the fiscal years 1924 and 1925. The total of these various appropriations is $87,747,099.93.

The new appropriation act, covering the fiscal year ending June 30, 1925, carries a total of $58,575,274. This includes all salary provisions for the Department thus far enacted but must be supplemented by the continuing appropriations, which for the new fiscal year are estimated at $12,360,750. The total funds available are therefore $70,936,024, a decrease of $16,811,075.93.

This comparison, however, is misleading as regards what may be termed the regular activities of the Department because of the inclusion in each case of large amounts for Federal aid in road construction. For the fiscal year 1924 no less than $32,300,000 is so allotted, while the 1925 allotment for this purpose is reduced to $19,000,000. After these items are eliminated the respective appropriations for 1924 and 1925 become $55,447,099.93 and $51,936,024, a net decrease of $3,511,075.93.

This figure represents the actual situation as regards appropriations, but it is in turn unsatisfactory because of the certainty of considerable deficiencies during the coming year. A number of items, of which the most significant was one of $3,500,000 for the foot-and-mouth campaign, were approved by both houses of Congress in a final deficiency bill which failed of passage in the closing hours of the session before adjournment June 7. Still further complication is occasioned by the failure to secure enrollment of a bill passed by both houses carrying appropriations supplementing the compensation of the field employees of the Government. These appropriations were to have been in lieu of the $240 bonus, previously carried for these employees but discontinued on June 30, and would have provided funds for a readjustment of salaries of employees outside of Washington under a plan which had been reported to Congress by the Personnel Classification Board on the basis of allocations submitted by the various departments. Following the adjournment of Congress an order was issued by President Coolidge putting the new scale into operation on July 1, as had been contemplated, wherever funds sufficient for the purpose were available to cover the period intervening before the reassembling of Congress. For the Department of Agriculture the additional funds which would thereby be required for the entire year are estimated at $3,538,942. Taking all these factors into account, the ultimate total provision for the work of the Department seems certain to be somewhat in excess of that of any previous fiscal year.

As regards the employees of the Department located in Washington, the act carries into execution on July 1 the reclassification of salaries which has been under consideration for several years. The classification schedules provide for a wide range in compensation, extending in the professional and scientific service from an entrance salary of $1,860 per annum in the junior professional grade, for which little or no experience is required, to a maximum of $7,500 for assistant secretaries of departments, chiefs of major bureaus, and comparable positions. The salaries of the Washington employees of the Department, numbering about 4,700 persons, are increased by $1,302,172, a net increase above the previous basic salaries and bonus of $393,932, and an average per individual of 4.5 per cent.

In putting the reclassification into effect, specific salaries are no longer itemized in the appropriation act, lump funds for personal services in the District of Columbia being provided for the various bureaus and offices on the basis of the allocations. This factor operates to alter practically every allotment in the act, although in varying degree, and must be taken account of in all comparisons with the legislation of early years. It is, of course, of most significance in items where the expenditure for salaries in Washington is proportionally high.

Taking up the allotments of the various bureaus and offices in turn, the Office of the Secretary receives $6,712,343. This includes as its principal items the usual payments of $1,440,000 to the States under the Hatch and Adams Acts, $1,300,000 for the supplementary extension work under the Smith-Lever Act, and $1,307,940 for the Department's own cooperative demonstration work. The allotment of $738,000 for the Department's printing and binding constitutes a curtailment of $22,000 from the previous year and of over $100,000 from the amount available two years ago. Funds for the Department's rent bill in the District of Columbia are increased by $20,000, making $196,866 available for this purpose, in addition to the use of $10,000 for the quarters at the American University occupied by the Fixed Nitrogen Research Laboratory, which is financed by a war-time appropriation originally made to the War Department.

The general funds available for the Office of Experiment Stations are apparently increased from $98,600 to $108,368, but this is fully accounted for by the salary readjustments previously explained. On the other hand, there is an increase from $205,000 to $210,000 in the total for the insular experiment stations. Of this amount the Hawaii Station receives $3,000 for sewerage connections and the Virgin Islands Station $2,500 for the completion of a water supply, while there is a reduction of $500 in the appropriation for the Alaska Stations. The allotments for the Porto Rico and Guam Stations are not changed, but the latter station was granted $3,500 in the deficiency appropriation act already referred to for the repair of damage caused by a typhoon in 1923.

The total appropriations of the Weather Bureau are fixed at $2,025,035, an apparent increase of $85,780. The allotment for forecasts and advice for the protection of horticultural interests is enlarged from $12,000 to $20,000 and broadened to include information as to spraying and other conditions as well as frost dates. Additional provision is made for studies of the influence of weather on crops, while the investigations carried on for several years in volcanology have been transferred to the Geological Survey of the Department of the Interior.

The appropriations carried in this act for the Bureau of Animal Industry aggregate $7,523,916, a sum which is, as usual, considerably in excess of that for any other bureau. Of this amount $386,600 is specifically allotted to the work in dairying for which an act approved May 29, 1924, provides a reorganization July 1 as a separate unit to be known as the Bureau of Dairying. The funds provided for the dairy work are continued without substantial modification.

An increase of $43,360 in the appropriation for inspection and quarantine work is attributable mainly to the authorization of the use of $30,000 for the resumption of the former practice of purchasing blackleg vaccine and distributing it at cost. The allotment of $2,027,600 for indemnities for cattle slaughtered in the campaign for the eradication of tuberculosis is increased by $400,000 and the funds for meat inspection by $204,970, the latter item covering the overtime pay of employees, which since 1920 has been assessed against the packers as an emergency measure.

Despite a number of reduced allotments, the Bureau of Plant Industry receives $3,687,924. This is an apparent increase from $3,376,470 and an increase over the estimates as approved by the Budget Bureau of $86,943 and is divided among several projects.

The largest item to be so increased is that of $328,480 for the control of white pine blister rust. This represents an enlargement by $60,040 to permit of a vigorous campaign designed to delay as much as possible the spread of the disease from the Canadian border in the Northwest. Another increase of $7,000 is to expedite the work of the seed testing laboratories, but authority to send delegates from the Department to the International Seed Testing Congress at London and Cambridge in July was refused. Other increases include $8,309 for tobacco investigations and $10,000 for the sugar plant studies, partly to enlarge the work with diseases. The appropriation for studies of dry land agriculture is continued on the present basis, but a limitation has been inserted prohibiting the establishment of additional field stations.

A new item is an authorization of $50,000 for exploration, research, and field experiments relating to potential rubber-producing plants. This, although a reduction of $20,000 from the estimates, will permit continuation of the work instituted in 1923 under a special appropriation of $100,000.

The Forest Service receives $6,781,489, together with $800,000 for the acquisition of additional lands at the headquarters of navigable streams and $400,380 for the cooperative fire protection of forested watersheds in these areas, making a total of $7,981,869 and an increase of $438,287. There is also made available $6,000,000 for the construction of forest roads and trails under the Federal Highway

Act. The expenditures of the service will as usual be offset to a considerable extent by the receipts from the national forests, which in 1923 amounted to $5,335,818.13. For 1924 and 1925 a surplus over the expenditures for the protection and maintenance of the forests is predicted.

A number of the specific allotments of the service have been decreased, but the principal changes in the appropriations are a net increase of $70,000 over the estimates for general expenses in the administration of the national forests; a similar increase of $10,000 to extend the construction of sanitary facilities and fire preventive measures on the public camp grounds, now numbering about 1,500 and utilized, it is estimated, by over 6,000,000 people last summer; and $50,000 for the establishment and maintenance of two additional forest experiment stations. The approximate doubling of the funds for the acquisition of additional forest lands is expected to make possible the addition of from 150,000 to 200,000 acres in the Eastern States to the 2,205,027 acres already purchased in this region.

The appropriation carried for several years for studies by the Bureau of Chemistry of dehydrating materials used as food has been eliminated, and the allotments for several other projects of the bureau are somewhat curtailed. A new item is an appropriation of $10,000 for the enforcement of the Naval Stores Act, and there is a net increase of $6,920 for extending the studies of insecticides and fungicides. For the bureau as a whole, however, its aggregate of $1,387,230 represents an apparent increase, exclusive of changes due to reclassification, of $6,271, or including this item a decrease of $25,145.

A similar condition prevailed as to the Bureau of Soils, an apparent increase from $358,975 to $391,600 becoming a net decrease of $21,935. The principal reduction is one of $14,950 in the soil survey, for which the new allotment is $179,710. This, it is believed, will necessitate some curtailment of the survey, which for the fiscal year 1923 included areas aggregating 17,282,560 acres in 26 States.

The appropriations of the Bureau of Entomology will for the first time exceed $2,000,000, its total rising from $1,797,880 in the previous act to $2,065,848. Of this increase $116,500 is for the work with deciduous fruit insects, the budget estimate for this purpose being exceeded by $57,080. This will permit of more extensive quarantine operations against the Japanese beetle, which has now spread over an area estimated at the close of scouting work in 1923 at approximately 2,500 square miles in New Jersey and Pennsylvania.

The allotment of $231,920 for combating southern field crop insects represents an increase above the estimates of $69,950. The principal project thereunder is the boll weevil campaign, with the chief points of attack the manufacture of calcium arsenate at lower cost and its application by improved dusting machinery. Considerable success has apparently been attained in the use of airplanes for dusting in cooperation with the War Department. The Chemical Warfare Service of the same department is authorized in its appropriation act to expend not to exceed $25,000 in "agricultural experiments in exterminating the cotton boll weevil."

Somewhat smaller increases of $32,000 and $40,300 are given for the work with insects affecting truck crops and the gipsy and brown-tail moth campaign. Wireworms are specifically included among the pests to be combated. The increase for the gipsy moth campaign, which is in addition to a deficiency appropriation of $70,000 granted in April, is to maintain a barrier zone against further western spread at the eastern line of Lake Champlain and the Hudson Valley.

Despite the salary reclassification the allotment of the Bureau of Public Roads, $474,175, shows substantially the same total, aside from the substantial appropriation for road construction already discussed, as last year. This is chiefly because of a transfer to the administrative fund provided under the Federal Road Act of the $15,000 appropriation previously carried for supervising the preparation and distribution of surplus war explosives. Provision is made for eventual reimbursement of this fund by other Federal activities, agricultural colleges, and other agencies receiving the explosives. The funds for the irrigation and drainage investigations of the bureau have been consolidated with an allotment of $145,650.

The Bureau of Agricultural Economics receives $4,325,864, as compared with $4,005,853 in the previous act and $35,550 in deficiency appropriations. If account is taken of the salary reclassification, a number of the allotments are found to have been substantially increased, while others show considerable reductions. Special mention may be made of the studies of the marketing and distribution of farm products, for which $549,628 will be available, of which $25,000 is allotted for an inquiry into the economic costs of retail marketing of meat and meat products, and $333,000 for the market inspection of perishable foods, the apparent increases in these projects being, respectively, $49,628 and $58,000. There are also apparent increases of $41,460 in the funds for the enforcement of the U. S. Cotton Futures and Cotton Standards Acts, $8,777 additional under the U. S. Grain Standards Act, and $50,100 more for the U. S. Warehouse Act, but if comparison is attempted it must be borne in mind that these were partially offset the previous year in the case of the two first named items by deficiency appropriations of $25,550 and $10,000, respectively.

The Bureau of Home Economics, which came into being July 1, 1924, with an initial appropriation of $71,760, receives an increase to $107,024. During its first year of independent existence considerable reorganization has been effected, including the institution of economic studies and the transfer to the Bureau of Animal Industry of the respiration calorimeter associated with the nutrition investigations of the Department from the days of Atwater and his associates. A comprehensive program for the development of the bureau has been formulated, with the assistance of a representative group of home economics workers, under which major emphasis will continue to be put upon problems in the preparation and preservation of food and nutrition studies, but with increasing provision for work in economics, textiles and clothing, and housing and equipment.

The work of the remaining branches of the Department is continued, without substantial change. The Bureau of Biological Survey receives $892,490, a decrease of $20,528; the Division of Accounts and Disbursements $74,440, an increase of $3,600; and the Library $70,960, a decrease of $2,720. Disregarding salary readjustments there are increases of $20,745 for the work of the Insecticide and Fungicide Board, $23,906 for that of the Federal Horticultural Board, $5,500 additional for the livestock field station at Woodward, Okla., $6,440 additional to combat the Parletoria date scale, and $42,040 additional to enforce the Packers and Stockyards Act. On the other hand there is a reduction in the funds for the campaign against the pink bollworm of cotton from $411,400 to $381,910.

Considered as a whole and with due allowance for the various complicating factors, the new act is quite largely a routine measure. It is exceptionally free from general legislation, and, while there are many exceptions, the bulk of the allotments correspond closely to the budget estimates and the present appropriations. The principal items of increase are, as a rule, in connection with the extensive regulatory activities of the Department or for an enlargement of control work directed against specific pests and diseases. The commencement of but comparatively few new research projects is authorized, but the maintenance of those in progress on their present basis is apparently adopted as a well-defined and accepted policy. In general, the conditions which have characterized the Department's work in recent years will apparently be little affected by the new act, and its prevailing policies and programs may be expected to be continued without material modification.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Plant alkaloids, R. WOLFFENSTEIN (*Die Pflanzenalkaloide. Berlin: Julius Springer, 1922, 3. ed., rev. and enl., pp. VIII+506*).—This reference book on the alkaloids contains an introductory section on the occurrence, formation, and detection of alkaloids and their physical, physiological, and chemical properties. This is followed by sections on artificial and natural alkaloids in which their chemistry and pharmacological properties are discussed. Many references to the original literature are given as footnotes.

The biological and chemical significance of gamma sugars, J. C. IRVINE (*Indus. and Engin. Chem., 15 (1923), No. 11, pp. 1162–1164*).—This is a general review of the discovery, probable constitution, and significant properties of the γ-sugars. In conclusion, the author states that "γ-fructose may, in fact, be nothing more than the ketonic form of the sugar and γ-glucose the corresponding aldehyde. It may well be that the aldoses and ketoses functioning in their primary capacity as aldehyde and ketone are the reactive sugars in nature, but this much seems clear—no naturally occurring compound of glucose, whether glucosid, disaccharid, or polysaccharid, has been found to contain the γ-glucose structure, and the reactive type of the sugar has hitherto been obtained only under artificial conditions. In sharp contrast, the two most important natural derivatives of fructose are each based on γ-fructose, which may possibly prove to be the connecting link in natural processes whereby the interconversion of ketoses and aldoses is effected."

Wood cellulose [trans. title], E. HEUSER and S. S. AIYAR (*Ztschr. Angew. Chem., 37 (1924), No. 3, pp. 27, 28*).—As proof that the celluloses of cotton and wood are identical, data are presented showing that from both forms of cellulose a pure triacetate can be obtained in the same proportions. On treating this triacetate with methyl alcohol in the presence of hydrogen chlorid, the same α-methyl glucosid is obtained in like amounts. On hydrolysis of the cellulose with 72 per cent sulphuric acid, both forms of cellulose yield like amounts of crystallizable glucose.

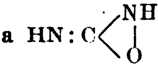
Effect of acids and salts upon the hydrolysis of wood, E. C. SHERRARD and W. H. GAUGER (*Indus. and Engin. Chem., 45 (1923), No. 11, pp. 1164, 1165, figs. 2*).—This paper supplements a previous study (E. S. R., 48, p. 713). A few additional salts were tested, but none gave increasing yields of sugar with the exception of barium chlorid and zinc chlorid, which, in the presence of hydrochloric acid, gave slightly greater yields than were obtained in the blank experiments.

Of the acids studied, the naphthalene sulfonic acids were the most promising. Oxalic acid gave a yield of sugar comparing favorably with those of the stronger acids, and trichloracetic acid gave the poorest results of all.

A comparison was made of the amount of fermentable sugar produced from white spruce by varying the concentration of sulphuric acid from 5 to 30 per cent and by varying the time and pressure. The maximum yield obtained during a 15-minute period was at a concentration of 10 per cent. On varying the time of boiling with this concentration and at a pressure of 115 lbs. per square inch, the maximum yield was obtained during a 10-minute period. On keeping the concentration constant at 7.5 per cent and the time at 15 minutes, and varying the pressure from 80 to 125 lbs., the maximum yield was obtained at a pressure of 120 lbs. A repetition of these experiments with mannose showed that it is susceptible to the same variations of conditions, indicating that the lowered production of sugar beyond certain points is due in part, at least, to the decomposition of mannose.

Partial hydrolysis of white spruce cellulose, E. C. SHERRARD and G. W. BLANCO (*Indus. and Engin. Chem., 15 (1923), No. 11, pp. 1166, 1167*).—A description is given of an easily hydrolyzable material which is present in considerable amounts in cellulose prepared from white spruce by the Cross and Bevan method.

The material can be removed from the cellulose only upon prolonged boiling with water, indicating that it is not present as such but is produced by mild hydrolysis. On concentrating the water extract to a thick sirup and precipitating with ethyl alcohol, the material separates as a white powder with low reducing value and giving no test for mannose. On hydrolysis with dilute acids, the reducing value is increased to about five times the original, and tests for mannose and pentoses are positive. The material is extremely soluble in water and is insoluble in alcohol, chloroform, acetone, methyl alcohol, and benzene. It contains about 37.4 per cent of the pentose and 42.8 per cent of the mannose contained in the original cellulose. Its chemical constitution has not yet been determined.

The chemistry of urea, E. A. WERNER (*London and New York: Longmans, Green & Co., 1923, pp. XII+212*).—This monograph is essentially an attempt to prove the author's theory that urea instead of being a carbamid has the cyclic formula  $\mathrm{HN}:\mathrm{C}\!<\!\begin{matrix}\mathrm{NH_3}\\ |\\ \mathrm{O}\end{matrix}$. Various methods for the detection and estimation of urea, the physico-chemical constants of urea, and a discussion of urea and the fixation of nitrogen are given in appendixes. An extensive bibliography is included.

Action of insulin on the composition of milk [trans. title], L. GIUSTI and C.-T. RIETTI (*Compt. Rend. Soc. Biol. [Paris], 90 (1924), No. 3, pp. 252, 253*).—Analyses are reported of the milk of two goats before and after the intravenous injection of insulin. On the day of the injection there was a slight decrease in the amount of milk obtained from one of the goats but no difference in the other, but on the day following the injection the amount obtained was always lower. There was a decrease in the percentage of lactose and a marked increase in the amount of fat, both of which were evident on the day of injection.

A gas-tight stirrer, G. E. HOLM and G. R. GREENBANK (*Indus. and Engin. Chem., 15 (1923), No. 11, p. 1134, fig. 1*).—A description, with accompanying diagram, is given of a gas-tight stirrer which has been devised at the Bureau of Animal Industry, U. S. D. A., for use when thorough mixing of a gas and liquid is desired and when it is necessary to measure the quantities of gas absorbed by a liquid in successive intervals of time.

A new fertilizer sampling tube, L. D. HAIGH (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 410-413, fig. 1*).—A new form of fertilizer sampling tube which is said to be free from the mechanical difficulties of the double-tube sampler of the Kellogg type (E. S. R., 47, p. 804) is described and illustrated.

The sampler consists of a brass tube 30½ in. long and approximately $\frac{11}{32}$ in. inside and ½ in. outside diameter, and a solid brass rod of the right size to slide in and out of the tube with slight pressure. The tube, which has a solid conical-shaped brass end and a cylindrical wooden handle, is provided with three longitudinal slits ¼ in. in width. In using the sampler the rod is placed inside the tube which is then pushed into a sack up to the handle. The rod is then removed and the tube rotated through an angle of 180° or until the grooves face upward and is then carefully withdrawn. The contents are shaken out on a sheet of paper and the rod is replaced in the tube. The tube is of such a size that it collects about ⅒ lb. each time.

Improvements in colorimetry, R. V. STANFORD (*Biochem. Jour.*, *17* (*1923*), *No. 6, pp. 839–843, figs. 2*).—Various improvements in the dilution colorimeter previously noted (E. S. R., 32, p. 20) are described which are thought to aid in convenience and accuracy.

In place of diffused daylight a Sheringham daylight lamp is used as the source of light. In regard to the colorimeter itself, a device has been added for automatically adding the solvent from a burette at a given rate, together with a mechanical stirrer adapted from a dentist's drilling agent. Possible errors in the equality of the cells and in the symmetry of the optical arrangements are said to be corrected in the manufacture of the apparatus.

The microscopical identification of some sodium and potassium salts, G. L. KEENAN (*Jour. Amer. Pharm. Assoc.*, *13* (*1924*), *No. 2, pp. 122–125*).—A microscopical method of identifying five salts commonly met in food and drug analysis—sodium and potassium chlorids, sodium and potassium nitrates, and potassium sodium tartrate (Rochelle salt)—has been devised at the Bureau of Chemistry, U. S. D. A.

The method involves the use of a microscope and a micropolariscope and five oils of known refractive indices. Suggested oils are Squibb's mineral oil, refractive index 1.488; toluene or a mixture of mineral oil and clove oil, refractive index 1.495; sandalwood oil or a mixture of clove oil and mineral oil, refractive index 1.505; clove oil or a mixture of mineral oil and monochloronaphthalene, refractive index 1.545; and anilin or a mixture of mineral oil and monochloronaphthalene, refractive index 1.585.

The principle upon which the method depends is that sodium and potassium chlorids crystallize in the isometric system and show no change from light to dark when the microscope stage is rotated with Nicols crossed. This serves to distinguish them from the other salts in the above list, which are doubly refractive and consequently show changes from light to dark when the stage is rotated with Nicols crossed. The identification of the individual salts can be made by the examination of portions of the crystals in oils of different refractive indices. Sodium chlorid has a refractive index of 1.544 and potassium chlorid of 1.490. In potassium nitrate the mean value of the two higher refractive indices is 1.505. Significant values for Rochelle salt and sodium nitrate are 1.495 and 1.587, respectively.

Determination of total sulphur in soils and silicate rocks, W. M. SHAW and W. H. MACINTIRE (*Indus. and Engin. Chem.*, *15* (*1923*), *No. 11, pp. 1183–1186*).—This contribution from the Tennessee Experiment Station consists of the detailed description of a method of determining total sulphur in soils which is said to combine the advantages of several different procedures.

The essential features of the method consist in the fusion of the soil with anhydrous sodium carbonate and sodium peroxid in a nickel crucible in an electric furnace, the disintegration of the melt with distilled water, followed by filtration, acidulation of the filtrate, and dehydration and removal of the silica, and the final precipitation of the sulphur as barium sulphate.

The detection of nitrates in vegetable or animal material [trans. title], T. SABALITSCHKA and C. SCHMIDT (*Ber. Deut. Pharm. Gesell.*, *33* (*1923*), *No. 5*, *pp. 181–184*).—A qualitative test for nitrates in organic materials is described as follows:

A small quantity of the sample is placed near the center of a watch crystal, and just beyond but not in contact with it a few drops of concentrated sulphuric acid are placed. A similar watch crystal is touched with a glass stirring rod which has been dipped in a solution of diphenylamin sulphuric acid prepared by dissolving one or two crystals of diphenylamin in 1 or 2 cc. of concentrated sulphuric acid. This watch crystal is placed over the first, which is then tilted to mix the concentrated sulphuric acid with the sample. In the presence of nitrates the diphenylamin sulphuric acid develops a blue color.

In the presence of bromids and iodids, the test is reliable only after standing for from 10 to 20 minutes. Chromates or chlorids alone do not interfere with the test, but when present together the former must first be removed. This is done by heating a small quantity of the sample with 5 cc. of 5 per cent hydrochloric acid at about 50° C. A small quantity of basic lead carbonate is added and the mixture heated to boiling, cooled, and filtered. To the filtrate a 10 per cent solution of neutral lead acetate is added until no further precipitate is formed. This is filtered and the filtrate evaporated to dryness on a water bath with a small amount of basic lead carbonate. The residue is then examined as in the original test.

Nesslerization, and the avoidance of turbidity in nesslerized solutions, R. V. STANFORD (*Biochem. Jour.*, *17* (*1923*), *No. 6*, *pp. 844–846*).—The occurrence of turbidity in nesslerized solutions is considered to be due to two causes: (1) The presence of foreign substances in the solution to be nesslerized and (2) a reaction occurring as the result of excess of alkali or of the Nessler reagent. The former is considered to be unavoidable and to necessitate in some cases the removal of the ammonia from the interfering substances by some such method as outlined in the following paper. Turbidity due to the second cause is said to be avoided if the concentration of the ammonia is below 0.03 mg. of nitrogen per cubic centimeter and if the Nessler reagent is one-tenth of the volume of the solution to be nesslerized and is added drop by drop with constant shaking.

Method for the rapid and quantitative removal of ammonia from solutions, especially applicable to the microquantitative estimation of nitrogen and urea in products of living origin, R. V. STANFORD (*Biochem. Jour.*, *17* (*1923*), *No. 6*, *pp. 847–850*, *fig. 1*).—A vacuum apparatus for the distillation of small quantities of ammonia is described and illustrated.

A 100-cc. distilling flask provided with a small separatory funnel with a capillary end leads into a container consisting of a small glass tube fitting loosely in a side-necked test tube, the receiver, which is connected through a tap with two traps which, in turn, are connected with the exhaust pump. In use, the distilling flask is sealed by being immersed in warm water and the receiver by having its cork smeared with glycerol. The receiver is surrounded by cracked ice and water. The process, which is described in detail, is said to take only 15 minutes and to result in an almost strictly quantitative transfer of ammonia, which is finally determined by nesslerization.

Determination of nitrate nitrogen in the presence of cyanamid and some of its derivatives, K. D. JACOB (*Indus. and Engin. Chem.*, *15* (*1923*), *No. 11*, *pp. 1175–1177*).—For determining nitrate nitrogen in the presence of calcium cyanamid, dicyanodiamid, and guanylurea, the author recommends the preliminary removal of the cyanamid and dicyanodiamid by precipitation with a saturated solution of silver sulphate and potassium hydroxid, as suggested by the method of Brioux in which silver nitrate was similarly used (E. S. R., 24, p. 323). The urea, which is not completely removed by this procedure, can be removed from an aliquot of the solution by the method described by Fox and Geldard (E. S. R., 50, p. 204), involving the hydrolysis of urea by the enzym urease of jack bean flour.

The technique of each method is described, and data are reported on the analyses of soil mixtures to which these materials had been added in varying amounts.

The estimation of pentoses and pentosans.—I, The formation and distillation of furfural, N. C. Pervier and R. A. Gortner (*Indus. and Engin. Chem., 15 (1923), No. 11, pp. 1167–1169*).—The literature on the formation of and methods of determining furfural is reviewed, and a comparison is reported of the present Official method, which has been said to give low results, with the distillation method of Jolles (E. S. R., 18, p. 308), for which theoretical results are claimed.

It was found that during the distillation carried out according to the Official method the concentration of HCl reaches values of from 18 to 20 per cent instead of the original 12 per cent, while if the distillation is conducted according to the technique of Jolles, the acidity remains at about 12 per cent. The low yield of furfural by the Official method is attributed to its destruction by the higher concentration of acid. A method is outlined whereby this can be prevented by the passage of a slow current of steam through the distillation mixture to carry the furfural off as rapidly as it is formed.

Actual methods of analysts employed in the municipal laboratory of Paris and papers on matters relating to nutrition.—II, Fats, butter, waxes, and paraffin, oil of turpentine, and mineral oils. III, Beverages and their immediate derivatives. IV, Vegetable products and derivatives. V, Water and air. VI, Tinning, toys, dyes, antiseptics, and sweetening agents. Detection of antiseptics and toxicology of foods, edited by A. Kling (*Méthodes Actuelles d'Expertises Employées au Laboratoire Municipal de Paris et Documents sur les Matières Relatives a l'Alimentation. II, Matières Grasses.—Beurre, Cires et Paraffine.—Essence de Térébenthine, Huiles Minérales. III, Boissons et Dérivés Immédiats. IV, Produits Végetaux et Dérivés. V, Eaux et Air. VI, Étamage.—Jouets.—Matières Colorantes, Antiseptiques et Édulcorants, Essais d'Antiseptiques, Toxicologie des Aliments. Paris: Dunod, 1922, vols. 2, pp. [2]+238, figs. 13; 4, pp. [2]+464, figs. 105; 5, pp. [2]+181, figs. 16; 1923, vols. 3, pp. [2]+292, figs. 12; 6, pp. [2]+204, pl. 1, figs. 2*).—These volumes continue the series previously noted (E. S. R., 47, p. 715). The subjects treated and their authors are as follows: Volume 2, Fats, Waxes and Paraffin, Oil of Turpentine, and Mineral Oils, by A. Leys, and Butter, by L. Pons; volume 3, Wine, by R. Schmutz; Cider, Perry, and Vinegar, by V. Génin; Beer, by J. de Brévans; Tartars and Lees, by D. Florentin; volume 4, Cereals and Their Products, by G. LeGall du Tertre; Cocoa, Chocolate, Tea, and Spices, by V. Génin; Micrography, by L. Robin; Saccharimetry and Sweetened Food Products, by Gelin; Alcohols and Alcoholic Beverages, by Cuniasse; volume 5, Chemical Analysis of Water, by J. Dieudonné; Microbiological Analysis of Water and of Air, by M. Lombard; Residual Water, by J. Lafore; Determination of Carbon Dioxid and Carbon Monoxid in Air, by D. Florentin; and volume 6, Tinning and Toys, by J. Froidevaux; Analysis and Detection of Coloring Matter, by Courtois; Antiseptics and Sweetening Agents, by L. Robin; Detection of Antiseptics, by M. Lombard; and Toxicology of Food, by Langlois and Huchet.

Determination of fat in alimentary paste, flour, and dried egg, R. HERTWIG (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 508–510*).—In the method described, the material is first subjected to hydrolysis with hydrochloric acid before being extracted with ether to obtain the fat for the usual determination by the Official Roese-Gottlieb method. Higher results were obtained in all cases than with the method of direct extraction.

The cryoscopic examination of milk, J. HORTVET (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 424–429*).—Detailed directions are given for the cryoscopic method for the examination of milk (E. S. R., 45, p. 506).

"A minimum freezing point depression of —0.530° C. and a maximum of —0.566° for milk from normal individual cows and a minimum of —0.530° and a maximum of —0.562° for milk from normal herds is substantiated by collaborative work carried out in various parts of the country on approximately 300 samples. Owing to these observed natural variations it is advisable to adopt a tolerance figure in passing judgment on market samples. A tolerance of 3 per cent may be deducted from results for added water calculated on the basis of an average freezing point depression of —0.550°. A thorough investigation of the cryoscopic properties of authentic samples in a given locality may justify a smaller, but scarcely a larger, tolerance figure. Owing to the narrow variations actually found among market milks of genuine character, it is not necessary in practice to deduct the tolerance figure from results showing added water in amounts above 3 per cent."

The reduction of methylene blue by iron compounds, E. J. MORGAN and J. H. QUASTEL (*Roy. Soc. [London] Proc., Ser. B, 95 (1923), No. B 665, pp. 61–71*).—In a further investigation of the Schardinger reaction in milk (E. S. R., 48, p. 207), a particular study was made of the effect of ferrous sulphate in bringing about the reaction in boiled milk. Evidence was obtained that the reduction of methylene blue by boiled milk in the presence of ferrous sulphate is due to the inorganic constituents present in the milk. Methylene blue was found to be reduced by ferrous sulphate solution in the presence of sodium hydroxid, carbonate, bicarbonate, or phosphate, and of the sodium salts of various organic acids such as acetic, tartaric, or citric, but not by ferrous sulphate alone. In discussing the mechanism of the reduction, the fact that two ferrous molecules always react with one of methylene blue is thought to indicate that "the oxygen of the methylene blue acts as hydrogen acceptor, taking up the two positive hydrogen ions to form electrically neutral water, the corresponding two negative hydroxyl ions being immediately taken up by the ferrous hydroxid to produce the slightly dissociated ferric hydroxid and thus preserving electrical equilibrium."

Prevention of the deterioration of raw sugar by inoculation with torulae, W. L. OWEN (*Internatl. Sugar Jour., 25 (1923), No. 295, pp. 371–374*).—The possibility is suggested of protecting raw sugar against deterioration by inoculation with torulae, and data are presented showing the protective action thus secured. This is considered to be due to the toxic effect upon other microorganisms of the carbon dioxid formed by the torulae.

Sorgo sirup manufacture, A. H. BRYAN and S. F. SHERWOOD (*U. S. Dept. Agr., Farmers' Bul. 1389 (1924), pp. 11+29, figs. 21*).—In this revision of Farmers' Bulletin 477 (E. S. R., 26, p. 512) only a few changes have been made in the subject matter, but the statistics have been brought up to date by figures for the production of sorgo sirup in various States in 1909 and 1919 and for the total production in the United States by years from 1919 to 1922, inclusive.

Nut margarins, J. T. Keister (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 502–508*).—A brief discussion is given of the growth and extent of the nut margarin industry in the United States and of the general methods of manufacturing nut margarins. This is followed by a report of the analyses of 15 samples of nut margarin, representing 15 different brands. The data include determinations of water, fat, curd, ash, sodium chlorid, and free acid as oleic, together with values obtained for the refractive index, melting point, Reichert-Meissl number, Polenske number, saponification number, and iodin number of the corresponding fats. In several of the samples, peanut oil was determined by Evers' modification of Bellier's method (E. S. R., 30, p. 209), which is considered to be capable of furnishing approximately quantitative results with nut margarins. Considerable variation was found in the composition and proportion of the fats used in the various brands.

METEOROLOGY.

Forecasting weather, W. N. Shaw (*London: Constable & Co., Ltd., 1923, 2. ed., rev. and enl., pp. XLIII+584, pls. 5, figs. 190*).—This is the second revised and enlarged edition of this treatise (E. S. R., 26, p. 809). The revision takes full account of the progress in scientific work relating to forecasting since 1911 and brings the information up to date. The book first explains and illustrates the construction of synoptic charts and their use in forecasting. Then follow discussions of physical processes involved in weather phenomena, forecasting specific phenomena such as storms, frosts, etc., recent progress in the use of weather charts, statistical methods for long period and seasonal forecasts, and the utility of the system of weather forecasts in England.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 10 (1923), Nos. 11, pp. [187], pls. 4, fig. 1; 12, pp. [193], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for November and December, 1923.

Climatological normals for Egypt and the Sudan, Candia [Crete], Cyprus, and Abyssinia, L. J. Sutton (*Cairo: Min. Pub. Works, Egypt, Phys. Dept., 1922, pp. X+100, pls. 12*).—Normals for pressure, temperature, precipitation, wind, and evaporation, based in most cases upon 20 years' homogeneous observations at 63 stations, are given, with a list of publications dealing with the climate and weather of Egypt and the Sudan.

SOILS—FERTILIZERS.

The effect of moisture on soil color, A. M. O'Neal (*Soil Sci., 16 (1923), No. 4, pp. 275–279, figs. 2*).—Brief preliminary studies conducted at the Iowa Experiment Station on the effect of varying moisture content on the actual color of light colored Clinton silt loam and dark colored Tama silt loam soils from Iowa are reported. Both soils are of loessial origin, the former being developed under timbered conditions and the latter on the prairies. The colors were determined on the air-dry soils and on samples containing 10, 20, 30, and 40 per cent of moisture.

The colors of both soils became darker as the moisture content increased until 30 per cent was reached. Beyond that point there was little change. The Clinton silt loam, with 20 per cent of moisture, closely resembled the Tama silt loam in an air-dry condition. When it contained 30 per cent of moisture it had very nearly the same color as the Tama silt loam with 10 per cent of moisture. The degree of color change between the soil in an air-dry condition and with 10, 20, and 30 per cent of moisture was more pronounced in the case of Tama silt loam than in the case of Clinton silt loam. This is taken to indicate that the darker colored soils, or those containing greater quantities of organic matter, show greater variations in color with changing moisture conditions. The color change, however, is not uniform.

It is considered evident from these results that the moisture factor may play a most important part in determining the color of soils and in the descriptions which are given in the survey reports.

The influence of acidity itself on plant growth without regard to other factors, A. G. McCall (*Jour. Amer. Soc. Agron., 15 (1923), No. 7, pp. 290–297*).—In a contribution from the Maryland Experiment Station, data from different experiment stations are summarized, indicating that the intensity of acidity, as determined by the H-ion concentration determinations, bears in general no direct or simple relation to the quantity of acid present in the soil. It is shown that the intensity of the acidity in many instances is of greater significance in biochemical processes than is the quantity of acid present. It is concluded that much additional experimentation is needed to determine what should constitute scientific corrective treatment for soil acidity for any particular system of cropping.

Testing soils for acidity, C. H. Spurway (*Michigan Sta. Quart. Bul. 6 (1924), No. 3, pp. 93–97, fig. 1*).—A practical colorimetric method for testing soils for acidity is briefly described and its use on the prevailing soil types of Michigan illustrated.

Factors influencing the activity of spore-forming bacteria in soil, J. S. Joffe and H. J. Conn (*New York State Sta. Tech. Bul. 97 (1923), pp. 3–21*).—Studies of soils variously treated and incubated in tumblers to determine under what conditions the spore-forming bacteria become active are reported. A microscopic method of examination was used.

The results indicate that spore-forming bacteria are active in soils only under conditions that do not frequently occur in ordinary farm practice. The vegetative stage of spore formers was not observed with applications of complete fertilizer at the rate of 2,000 lbs. per acre, which is an unusually high rate under general farm conditions. Additions of excessively large amounts of nitrogenous organic substances, such as dried blood, peptone, and peanut meal, temporarily induced the vegetation of spore formers, but the vegetative stage did not appear with applications of these substances at practical rates. More easily decomposable organic materials stimulated the vegetative stage to a greater extent.

A high moisture content, close to the saturation point, allowed the vegetative stage of spore formers to appear to a small degree. It is considered possible that the spore formers vegetating under such conditions may belong to anaerobic groups. Heavy applications of barnyard manure rich in urine induced the spore formers to vegetate for a short period.

The experiments indicated that these organisms use carbohydrates more readily than nitrogenous materials. It was observed that an unusually great alkalinity in the soil tended to allow the vegetative forms to develop. On the other hand, an acid reaction brought about by the addition of an inorganic acid did not do so.

Partial sterilization of soil, microbiological activities, and soil fertility, II, S. A. Waksman and R. L. Starkey (*Soil Sci., 16 (1923), No. 4, pp. 247–268, figs. 16*).—In a second contribution to the subject from the New Jersey Experiment Stations (E. S. R., 50, p. 620), it is pointed out that the great variability of field soils, both in regard to chemical composition and numbers of microorganisms, is one of the chief disadvantages when working with them. In this connection a soil with a known history as far as microorganisms and their activities are concerned was prepared. The results of the influence of partial sterilization by volatile antiseptics, heat, and calcium oxid upon the numbers of bacteria, fungi, Actinomycetes, and protozoa, and on their activities in this soil, are reported. These are compared with the influence of air-drying, addition of calcium carbonate, and the influence of small amounts of organic matter and sulphur upon the same microbiological activities.

The mere mixing of soil, without allowing it to air-dry, resulted in only a slightly stimulating effect on bacterial action, as indicated by carbon dioxid production. There was a depression in bacterial numbers, and the protozoa were not affected. The fungi were at first depressed and then stimulated, and the depression was accompanied by a reduction in nitrate content.

The application of calcium oxid to the soil had a pronounced effect in disturbing or even destroying the state of microbiological equilibrium. The addition of 0.5 per cent of calcium oxid had a decided sterilizing effect upon the microbial population of the soil. The depression of carbon dioxid production was accompanied by a depression in the numbers of bacteria and fungi, which, however, rapidly increased when the pots were aerated. The protozoa were destroyed by the calcium oxid treatment, but after 28 days large numbers were found in the soil. This particular period coincided with the maximum development of bacteria and fungi, as well as the maximum rate of carbon dioxid evolution. The rapid development of microorganisms brought about a decrease in the amount of nitrate in the soil, but as soon as the carbon dioxid production began to decline an increase in nitrate accumulation took place. These results are considered to oppose any attempt to explain the phenomenon that has taken place by the destruction of protozoa.

The influence of calcium carbonate upon the microbiological activities in the soil was distinctly different from that of calcum oxid. There was a marked evolution of carbon dioxid soon after the calcium carbonate was added to the soil. This soon decreased to a low level, only slightly above the control. Bacterial numbers were stimulated to only a limited extent. The addition of calcium carbonate did not result in a group of phenomena characteristic of partial sterilization.

Air-drying of the soil, followed by moistening with distilled water, resulted in a decidedly stimulating effect upon the activities of the microorganisms, as indicated by an increase in numbers of bacteria and fungi and in carbon dioxid production, and by a decided decrease in nitrate content. This stimulating effect of air-drying was of only short duration. Air-drying did not destroy the protozoa, the flagellates being as abundant as in the untreated soil. This is taken to indicate again that the destruction of the protozoa can not account for the stimulating effect upon bacterial activities. The results are considered to indicate further that air-drying modifies the organic matter of the soil, making it a more available source of energy for microorganisms.

Heating of soils at 65° C. (149° F.) for 1 hour also produced a decrease in the number of bacteria and fungi, followed by an increase, and also a rapid increase in the amount of carbon dioxid production, followed by a rapid decrease. The protozoa disappeared and did not reappear in appreciable numbers for 28 days. The nitrate content was increased. The bacterial numbers did not decrease as rapidly as in the case of air-dried soils. The fungi did not increase rapidly and continued to increase even after 80 days. The gradual course of increase of numbers of fungi was peculiarly parallel to the gradual fall of bacterial numbers. The nitrate content, after a slight increase, actually continued to decrease. When the heated soil was reinoculated with 0.5 per cent of a fresh soil, the protozoa began to develop much more rapidly, appearing abundantly after 14 days. Carbon dioxid production was similar to that in uninoculated soil, and the bacterial numbers reached a higher maximum but dropped much more rapidly. The numbers of fungi remained consistently low for a long time. The nitrates decreased in a manner parallel with the increase in bacteria and began to increase with the decrease in bacterial numbers. These results are taken to indicate that the steaming of soils brings about a greater solubility of organic soil constituents.

Treatment of the soil with toluene brought about an increase in carbon dioxid production followed by a rapid decrease, a decided increase in bacterial numbers, and practical destruction of the fungi. The protozoa at first disappeared, then reappeared after 28 days. The nitrates were greatly decreased, but after a long period of time they began to increase.

Treatment of soil with 1 per cent of carbon bisulphid resulted in phenomena very similar to the toluene treatment, heating of soil, air-drying, and calcium oxid treatment. The addition of 0.2 per cent of ground dry alfalfa meal resulted in changes in the microbiological activities very similar to partial sterilization of soil. The addition of a small amount of sulphur resulted in a slight decrease in the numbers of bacteria, and a slight increase in the number of fungi and in the carbon dioxid producing capacity of the soil.

Partial sterilization of soil, microbiological activities, and soil fertility, III, S. A. Waksman and R. L. Starkey (*Soil Sci., 16 (1923), No. 5, pp. 343–357*).—In a third contribution to the subject, studies made to compare partially sterilized soils with normal soils, with particular reference to their efficiencies for decomposing added organic substances, are reported.

The results showed that partial sterilization of soil brings about a chemical change in the soil organic matter, making it more available as a source of energy for microorganisms. This was indicated by (1) the ammonia formation in the process of sterilizing soil by heat or disinfectants, (2) the fact that the curve of carbon-dioxid evolution in partially sterilized soil was similar to that obtained when a small amount of undecomposed organic matter was added to unsterilized soil, (3) the fact that soils rich in organic matter allowed a greater accumulation of ammonia and nitrates, as a result of partial sterilization, than soils deficient in organic matter, independent of the flora and fauna, and (4) the fact that partially sterilized soil with a much greater bacterial flora was no more efficient in decomposing nitrogenous and nonnitrogenous organic substances added to it.

A large proportion of the soil fungi was killed as a result of partial sterilization. This dead material, with the bodies of destroyed protozoa and other soil microorganisms, still further increased the amount of energy made available in the soil. The rapid increase in the number of microorganisms in the soil was found to be at the expense of the organic matter made available. This was further confirmed by the fact that the course of development of fungi resulted in a curve somewhat similar to that given by the bacteria, although the rise in the curve may take place at a later date.

Carbon and nitrogen were found in soil in a certain proportion, depending upon the physical and chemical condition of the soil. When the carbon compounds were decomposed as sources of energy by the bacteria and Actinomycetes, some of the nitrogen was left as a waste product. The carbon-nitrogen content of the soil and of the bodies of the bacteria, Actinomycetes, and fungi, combined with the economic utilization of the carbon by these three groups of organisms, are thought to explain why the development of the first two groups of organisms will bring about the liberation of nitrogen from the soil organic matter to a greater extent than the development of the fungi.

The actual amount of ammonia formed in partially sterilized soil was determined not by the numbers of bacteria and fungi developing in the soil, but by the abundance of organic matter. The course of development of numbers of bacteria in the soil seemed to be influenced by the course of development of the fungi. The course of development of Actinomycetes depended upon the method used in bringing about the partial sterilization of the soil as well as upon the organic matter content.

The protozoa were suppressed in partially sterilized soil, but became active again long before the bacterial numbers dropped down very markedly. The more rapid the rise in bacterial numbers and the greater the maximum, the sooner did the fall set in. This was exactly true of the numbers of fungi. These phenomena are considered to be the results of the available number of plant nutrients in the soil.

The phenomena observed as a result of partial sterilization of soil, viz, the rise of bacterial numbers and ammonia accumulation, are explained by (1) the change in the physical condition of the soil, especially the soil colloids, (2) the change in the chemical condition, especially the modification of soil organic matter, making it more readily available, (3) the destruction of a large number of soil microorganisms, especially the fungi and protozoa, making their bodies available as sources of energy for the surviving microorganisms, (4) the change in balance of the microbiological flora of the soil, all of which favor greatly the development of the bacteria, and (5) the fact that bacteria use organic nitrogenous substances as well as other carbon compounds very uneconomically as sources of energy and liberate a great deal of ammonia as well as phosphates and other minerals stored away in the soil organic matter as waste products.

Energy sources and microbiology of soil [trans. title], F. H. Hesselink van Suchtelen (*Centbl. Bakt.* [etc.], *2. Abt.*, *58* (*1923*), *No. 19–24*, *pp. 413–430*, *figs. 2*).—Studies are reported to determine (1) the quantities of energy available to soil microorganisms which have been added to the soil in fertilizers and manures or are already present in the soil in the form of humus, and (2) the quantities of heat resulting from the biochemical transformation of the energy materials present in soils.

The heating values of the different materials studied were found to represent an energy supply which is considered to be available to soil microorganisms. On this basis, it is concluded that the ordinary arable soil contains quite considerable quantities of energy which is available to microorganisms. The calorimetric studies showed that a productive soil will produce relatively large heat quantities by biochemical transformation, but that fixed data on the heat production of soil in microcalories can not be evolved until the variations therein have been accurately explained.

Inorganic substances, especially aluminum, in relation to the activities of soil microorganisms, A. L. Whiting (*Jour. Amer. Soc. Agron.*, *15* (*1923*), *No. 7*, *pp. 277–289*).—In a contribution from the Illinois Experiment Station, a summary of data on the subject from several different experiment stations is presented.

This indicates that soluble salts of aluminum have been found in acid soils which have been treated with soluble salts of other metals by a number of investigators. Aluminum in soluble form has been found in soils where sulphur is being oxidized, and calcium carbonate has been found to inactivate toxic aluminum, iron, and manganese when not used in excessive quantities.

Phosphates have likewise been found to prevent the injurious action of aluminum. Aluminum associated with hydrolyzable and highly ionizable salts has been shown to exert a toxic influence on plants aside from the acid effect of the associated acid radical. Aluminum phosphates have been demonstrated to be excellent sources of phosphorus for a number of farm crops in spite of their aluminum content.

Soils which have not been treated with salts have shown practically no soluble aluminum in clear water extracts. Practically all acid soils which have been studied contained quantities of easily replaceable aluminum when brought into contact with salt solutions. Certain acid soils contain large amounts of soluble manganese, and this element appears to support nitrification. Soluble manganese has been found to occur in soils as a result of sulphur oxidation.

The available information indicates that the use of moderate amounts of liming materials and ample quantities of phosphates will precipitate the toxic forms of aluminum, iron, and manganese in acid soils and at the same time permit the establishment of pH values in keeping with the requirements of soil organisms, the growth and feeding power of crops, and their response to fertilization.

It is concluded that the gradual development of toxic conditions in a soil is generally accompanied by a gradual reduction of nontoxic available bases. These conditions are aggravated, as far as crops and organisms are concerned, by a scarcity of certain essential elements, particularly phosphorus and potassium. Points in need of urgent further investigation are briefly enumerated.

Depressive influence of certain higher plants on the accumulation of nitrates in soil, T. L. LYON, J. A. BIZZELL, and B. D. WILSON (*Jour. Amer. Soc. Agron., 15 (1923), No. 11, pp. 457–467, pl. 1*).—Studies conducted at Cornell University are reported in which a crop of oats was raised in 20 cans filled with Dunkirk silty clay loam soil to bring the soil to a uniform and low nitrate content. Six of the cans were planted to maize, 6 to wheat, and 6 were left unplanted. The plants and roots were removed and analyzed for nitrogen and the nitrates determined in the soil at the end of 57, 77, and 119 days after planting. Assuming that the nitrogen of the plants had been converted into nitrate before being absorbed, a comparison was made of the quantity of nitrate which accumulated in the planted and unplanted soil. It was found that maize did not depress nitrate accumulation during early growth but did so later. Wheat showed a depressing influence at the end of the first period and continued to exert a depressing effect throughout its entire period of growth.

Similar cans were partly filled with soil containing roots of oats, maize, timothy and red clover, and dried blood. The mixtures stood in the cans for three months, during which time they were occasionally leached and the nitrate nitrogen determined in the leachings. The quantities of nitrate nitrogen recovered from the different roots and dried blood were directly in the order of the percentage of nitrogen in these substances, although the total quantity of nitrogen was the same for each can. This is taken to indicate that the composition of the organic matter liberated by the leachings or by the decomposing plant roots has a potent influence on the activity of the nitrate consuming organisms.

Toxic organic soil constituents and the influence of oxidation, O. SCHREINER (*Jour. Amer. Soc. Agron., 15 (1923), No. 7, pp. 270–276*).—In a contribution from the U. S. D. A. Bureau of Plant Industry, a brief summary is presented of the investigations which have been conducted for some years on the origin, nature, and treatment of toxic organic constituents which have been found in infertile soils. Several such bodies have been isolated from different soils having quite different chemical properties. Some of the organic compounds found in soil organic matter are beneficial and others are inimical to plant life. A balance of these two contending influences is said to exist in every soil, such that decreased soil fertility, in so far as it may be influenced by the chemical composition of the soil organic matter as a single factor, is due to the preponderance of that type of biochemical action which will result in the accumulation of harmful compounds.

It is considered significant that such toxic constituents have for the most part resulted from partial oxidation, and are under favorable conditions subject to further oxidation. The studies on the ability of soils to oxidize organic substances have shown that fertile soils are generally good oxidizers and infertile soils poor oxidizers. Thus, in soils which are good oxidizers the chances of an undue accumulation of toxic substances are small, whereas in poor soils with low oxidizing powers harmful substances may result. The chief aim in improving infertile soils is therefore to build them up so that they will become good oxidizers.

Organic phosphorus of soils, J. T. AUTEN (*Soil Sci.*, *16* (*1923*), *No. 4*, *pp. 281–294*).—Studies were conducted at the Iowa Experiment Station (1) to test the Potter and Benton method of determining organic phosphorus in soil, (2) to determine whether organic phosphorus occurs in soils in chemical combination or is adsorbed, and (3) to determine the nature of the organic phosphorus compounds. The soil used was Jackson silt loam selected because of its high content of organic phosphorus and its low content of organic matter.

The results showed that organic phosphorus exists in large amounts in some soils and may be determined with a fair degree of accuracy by the above method. It is considered probable, however, that organic phosphorus does not exist in any considerable amount as nucleic acid, phytin, or lecithin and is not an accumulation of pyrimidin nucleotids. It is further considered probable that inorganic phosphorus compounds when added to soils are hydrolyzed, and that the inorganic phosphorus combines in a calcium-magnesium or other metal salt of an organic amphoteric complex.

A 5-year lysimeter study of the supposed liberation of soil potassium by calcic and magnesic additions, W. H. MACINTIRE, W. M. SHAW, and J. B. YOUNG (*Soil Sci.*, *16* (*1923*), *No. 4*, *pp. 217–223*, *fig. 1*).—Studies conducted at the Tennessee Experiment Station on the leaching of potassium from a 23-unit lysimeter during a 5-year period, under the influence of additions of limestone, dolomite, calcium oxid, and magnesium oxid in chemical equivalence at the rate of 2,000 lbs. of calcium oxid per 2,000,000 lbs. of soil, are reported. Calcium oxid and magnesium oxid were also used at an equivalent rate of 3,759 lbs., and five treatments each of ferrous sulphate, pyrite, and elementary sulphur were used, four of each set receiving supplements of lime or magnesia each at two rates.

The results showed that every form and rate of calcic and magnesic treatment alone and in conjunction with sulphates depressed the losses of potassium. Increases over the control were obtained in the three cases where sulphur carriers were used when not supplemented by either alkali-earth, but such increases were found to represent only a minute fraction of the theoretical liberation to be accredited to the amounts of calcium and magnesium sulphates derived from the sulphur treatments.

A simple method for determining the nutrient requirements of soils, especially for potash and phosphoric acid [trans. title] NEUBAUER (*Mitt. Deut. Landw. Gesell.*, *38* (*1923*), *No. 47*, *pp. 596–599*).—A method is briefly described in which the soil to be tested is covered with sterile quartz sand and planted with rye. The rye is harvested after from 14 to 18 days and analyzed for potash or phosphoric acid. Using similar results obtained from the sand, the amount of the nutrient material withdrawn from the soil by the rye plant is determined.

A comparison of these results with an apparently arbitrarily chosen standard is taken to indicate the relative amount of available plant nutrient material in the soil and consequently the nature and amount of fertilizer treatment required. A comparison of the results of this test with actual vegetation tests is presented.

Soils of the Great Plains, C. F. MARBUT (*Ann. Assoc. Amer. Geogr., 13 (1923), No. 2, pp. 41–66, pls. 2, figs. 2*).—In a contribution from the U. S. D. A. Bureau of Soils, the characteristic properties of the soils of the Great Plains region are described.

These soils are said to be uniform to the extent that they are dark in color and are underlaid by a zone of calcium carbonate accumulation. They differ in the degree of darkness of the soil color from place to place, and in the depth as well as in other minor characteristics of the carbonated zone. The region as a whole is divided into three north-south belts of soil on the basis of the darkness of soil color, which are designated as the black belt, dark brown belt, and brown belt. The northern end of the region is designated as the very dark brown belt.

Soil survey of Carroll County, Ga., H. G. LEWIS ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+129–154, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, deals with the soils of an area of 318,080 acres in the Piedmont Plateau region in western Georgia. The topography ranges from smooth and gently sloping, through undulating or rolling, to rough, steep, and broken. The drainage of the county is said to be well established and complete.

The upland soils of the county are said to be of residual origin. Other soils are of alluvial origin. The soils range in texture from gravelly sandy loams to clay loams. As a whole they are said to be deficient in organic matter and lime. Including meadow, 17 soil types of 7 series are mapped, of which the Madison gravelly sandy clay loam and the Cecil and Madison sandy clay loams cover 30.3, 12.1, and 10.7 per cent of the area, respectively.

Analyses of soils of Early County [Ga.], L. M. CARTER, M. W. LOWRY, W. O. COLLINS, and R. M. SOULE (*Ga. Agr. Col. Bul. 289 (1923), pp. 48, figs. 3*).—This reports a chemical study of the soils of Early County, made to supplement the physical survey conducted in cooperation with the U. S. D. A. Bureau of Soils (E. S. R., 45, p. 325).

The analyses show that the principal soils of the county are deficient in nitrogen, phosphoric acid, and potash. The soils of the Blakely and Congaree series are the only ones which contain fair total amounts of plant nutrients. All of the soils of the county are deficient in phosphoric acid, and all except the Blakely and Congaree soils are exceptionally deficient in nitrogen.

Soil survey of Iowa-Mahaska County soils, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpt. 29 (1923), pp. 72, pl. 1, figs. 14*).—This survey deals with the soils of an area of 363,520 acres lying entirely within the southern Iowa loess soil area in south-central Iowa. The topographic features of the county vary from steep, broken, and hilly in places to rolling or gently rolling throughout the major portion of the upland plains. The natural drainage system is said to be quite complete.

The soils of the country are grouped as drift, loess, terrace, swamp and bottomland, and residual soils. The loess soils covered 76.9 per cent of the area. Including riverwash, 24 soil types of 17 series are mapped, of which the Clinton, Tama, and Grundy silt loam loess soils cover 33.4, 22.4, and 20.3 per cent of the area, respectively.

Greenhouse and field experiments to determine the fertility requirements and crop adaptations of the prevailing types are briefly reported, indicating that practically all the soils of the country are acid and that they are in general deficient in phosphoric acid and organic matter. Data on the prevention of erosion are also presented.

Economical fertilization of muck land, P. M. Harmer (*Michigan Sta. Quart. Bul., 6 (1924), No. 3, pp. 101–103, figs. 2*).—Data from 35 different fertilizer projects located on 29 distinct muck areas are briefly summarized.

Nitrogen survey.—I, The cost of Chilean nitrate, H. F. Bain and H. S. Mulliken (*U. S. Dept. Com. Bur. Foreign and Dom. Com., Trade Inform. Bul. 170 (1924), pp. II+69, figs. 2*).—The results of a general survey of the Chilean nitrate industry, with particular reference to determining the quantity of supplies and the lowest price at which natural nitrate can be furnished to American consumers under conditions of maximum efficiency of production and minimum charges and profits, are reported.

It is concluded that there is no reason to anticipate any shortage of raw material, and that the supply is sufficient to meet the probable demand for one or more centuries. There is also said to be little reason to anticipate any considerable or general reduction in cost in the mining of the raw material, owing to the mode of occurrence of the caliche, the present state of efficiency of Chilean labor, and the limited opportunity for machine mining.

It is thought that the present wasteful method will give way to one which will result in an increase of yield on the average of about 25 per cent from the same material. It is considered entirely probable that the treatment of caliche can be done with less fuel, that used by present methods approximating half of the treatment cost per ton. Operations on a larger scale at centralized plants are, in general, possible and are already being introduced. These are said to be capable of reducing local overhead expenses by about as much as 25 per cent. Experience, as shown by the sale of quotas in Chile, indicates that unless a gross profit of $6 per ton is made it is cheaper to close down.

It is considered clear that unless the tax system be changed and the maximum possible economy in production be introduced the effect of increased marine rates and of a rise in exchange will wipe out possible reductions, and may even lead to a slight increase in price. It is stated, however, that the present price of $48 f. o. b. American seaboard could by the abandonment of taxes, by improved methods, and by the narrowest margin of profits be reduced to about $35 per ton.

Vegetation experiments with the mica minerals biotite and sericite as sources of potash [trans. title], B. H. Cranner (*Norges Geol. Undersøk. No. 114 (1922), pp. 37, pls. 10*).—Pot experiments are reported, the results of which are taken to indicate that the biotite which occurs so extensively in Norway is a satisfactory source of potash for crops, especially beans and oats. Sericite was also found to be quite a satisfactory source of potash for beans.

Sulphur as a supplementary fertilizer [trans. title], A. A. Kaluzhskiĭ (*Izv. Saratovsk. Selsk. Khoz. Inst. (Ann. Inst. Agron. Saratov), 1 (1923), No. 1, pp. 99–104*).—Experiments at the Saratov Experiment Station on the use of sulphur in soil to increase the availability of the phosphoric acid of rock phosphate are reported. These showed that rather large additions of sulphur increased the yield of millet about 5.5 times. It is thought that smaller applications would have produced greater increases.

Sulphur oxidation in the soil [trans. title], A. A. Kaluzhskiĭ (*Izv. Saratovsk. Selsk. Khoz. Inst. (Ann. Inst. Agron. Saratov), 1 (1923), No. 1, pp. 88–98, fig. 1*).—Studies conducted at the Saratov Experiment Station on the variation in the quantities of soluble sulphates in soils during the year are reported.

The quantities of sulphates in soils soluble in water were found to vary widely during the year. They were at a minimum in the spring and reached a maximum in the fall. In this respect it is considered evident that the phenomenon of sulphur oxidation in the soil is analogous to nitrification. It is further concluded that, in general, the cause of the enrichment of soils in sulphates is the process of sulphur oxidation. The rapidity of sulphur oxidation was found to increase with the temperature. Periodical analyses were necessary in order to gain a complete knowledge of the soluble sulphates in the soil.

The action of sulphur on saline soil [trans. title], A. A. KALUZHSKIĬ and A. E. SOLNTSEVA (*Izv. Saratovsk. Selsk. Khoz. Inst.* (*Ann. Inst. Agron. Saratov*), *1* (*1923*), *No. 1, pp. 141–155*).—Studies at the Saratov Experiment Station on the use of sulphur for the improvement of saline soils are reported.

The results of pot cultures showed that sulphur exercised a very favorable influence on the development of barley, the yield being increased 56.7 per cent. Sulphur seemed to have the same effect as phosphoric acid on crops. Analyses of the soil before and after cultivation showed that during the experiments, which extended over 101 days, almost half of the sulphur was oxidized to sulphuric acid. The sulphur exercised a marked diminishing effect on the alkalinity of the soil and greatly increased the quantity of salts soluble in water. The osmotic pressure of the soil solution was also increased.

Inspection of commercial fertilizers, H. D. HASKINS, L. S. WALKER, and S. J. BRODERICK (*Massachusetts Sta. Control Ser. Bul. 25* (*1923*), *pp. 31, figs. 4*).—Guaranties, valuations, and the results of actual analyses of samples of 457 brands of fertilizers and fertilizer materials collected for inspection in Massachusetts during the period from July 1, 1922, to July 1, 1923, are presented and discussed. A complete list of registrants is included. Data are also included on a vegetation test for nitrogen activity.

Inspection of lime products used in agriculture, H. D. HASKINS, L. S. WALKER, and S. J. BRODERICK (*Massachusetts Sta. Control Ser. Bul. 26* (*1923*), *pp. 6, fig. 1*).—Guaranties and results of actual analyses of 25 samples of limes and lime ashes representing 21 brands collected for inspection in Massachusetts during the year 1923 are presented and discussed.

Inspection of commercial fertilizers for 1923, H. R. KRAYBILL, T. O. SMITH, and C. P. SPAETH (*New Hampshire Sta. Bul. 210* (*1923*), *pp. 16*).—Guaranties and actual analyses of samples of 101 brands of fertilizers and fertilizer materials collected for inspection in New Hampshire during 1923 are presented and discussed.

Commercial fertilizers in 1922–23, G. S. FRAPS and S. E. ASBURY (*Texas Sta. Bul. 312* (*1923*), *pp. 3–35*).—Guaranties, actual analyses, and valuations of 656 samples of fertilizers and fertilizer materials collected for inspection in Texas during the year 1922–23 are presented and discussed. A list of the registrations and general information on the uses of fertilization on crops of the State are also included.

AGRICULTURAL BOTANY.

Plant physiology, V. I. PALLADIN, edited by B. E. LIVINGSTON (*Philadelphia: P. Blakiston's Son & Co., 1923, 2. Amer. ed., pp. XXXIII+360, pl. 1, figs. 173; rev. in Bot. Gaz., 75* (*1923*), *No. 4, pp. 428, 429*).—This, the second American edition of this work (E. S. R., 27, p. 219; 38, p. 728), published after the author's death (E. S. R., 46, p. 799), adds a few corrections, clarifications, editorial notes, references to the literature, and summaries of the chapters.

The main points of the Palladin theory of respiration are summarized by the editor as follows: "Under the influence of enzyms, carbohydrates and similar substances are anaerobically decomposed into carbon dioxid and incompletely oxidized organic compounds, these partial oxidations occurring partly at the expense of oxygen derived from the decomposition of water. The hydrogen produced by aqueous decomposition may sometimes be set free, or it may disappear in the reduction of some of the incompletely oxidized compounds just mentioned, but it is regularly oxidized in aerobic respiration, with the formation of water. The aerobic oxidation of hydrogen occurs by two stages: (1) This element combines with respiration pigments (acceptors of hydrogen), thus forming respiration chromogens. (2) The chromogens, in turn, are oxidized by free oxygen, under the influence of oxidizing enzyms, forming water and respiration pigments. Thus, in normal, or aerobic, respiration, the carbon dioxid produced is a product of anaerobic respiration (fermentation), while the water produced is a product of the oxidation, by free oxygen, of anaerobically produced hydrogen. Anaerobic respiration occurs in all living cells, of animals as well as plants, while aerobic respiration is confined to those forms that are supplied with free oxygen and possess adequate oxidizing enzyms. This theory, with all the details that it implies, must be regarded as one of the most brilliant achievements of physiological science, and it may be said to represent the main contribution Palladin made to the advance of appreciative human knowledge."

The anatomy and physiology of the seed plants, R. E. TORREY (*Amherst: Mass. Agr. Col., Dept. Bot., 1922, pp. VIII+85, fig. 1*).—This handbook, presupposing an introductory study of plants based on the idea of evolutionary adaptation of plant organs to environment, is intended to help familiarize the student first with the structure of the plant as a mechanism and then with this mechanism in action. The several chapters deal with the structure and activities of the cell, the anatomy of the vegetative system of the seed plants, coal and its formation, the physiology of the vegetative system, the reproduction of seed plants, and introductory genetical principles, concluding with an introduction to the lower forms of plant life.

Delayed germination and catalase activity in Xanthium, C. A. SHULL and W. B. DAVIS (*Bot. Gaz., 75 (1923), No. 3, pp. 268–281*).—It is found that the upper seeds of Xanthium show constantly less catalase activity per unit of dry substance than the lower seeds. In dry seeds stored for several months catalase activity is relatively stable. Stored in imbibed condition in germinators below the temperature for germination, the catalase activity of both uppers and lowers increases immediately following exposure in the germinators.

In the field during the germination season, lower seeds increase in catalase activity, while the uppers lag behind them, showing practically no increase.

In the laboratory, soaking seeds on ice seems to depress activity slightly, but during subsequent germination, catalase activity increases with the germination. Upper seeds show much less increase than lowers, except when they actually germinate.

The catalase differences in Xanthium seeds are in harmony with other physiological differences, which cooperate to bring about delayed germination of upper seeds with intact coats.

Moisture content of peach buds in relation to temperature evaluations, E. S. JOHNSTON (*Bot. Gaz., 74 (1922), No. 3, pp. 314–319, figs. 2*).—"It is realized that the observations discussed in this paper are somewhat limited in number, but nevertheless they suggest a definite relationship between air temperature and the rate of increase in the moisture content of peach fruit buds. There can be little doubt, however, that other conditioning influences are operative before January 1 that determine the manner in which these buds responded to temperature."

A simple apparatus for controlling temperatures, E. E. Hubert (*Bot. Gaz., 74 (1922), No. 3, pp. 333, 334, fig. 1*).—In developing the control equipment for a humidity chamber in which it was desired to control temperatures over long periods of time, it was found essential to use a temperature control apparatus activated by an electric current taken from the ordinary lighting circuit. Troublesome failures with dry cells and storage batteries led to the construction of the apparatus described. The main advantage of this apparatus lies in the fact that the same current (110 volts, 60 cycle, alternating) which passes through the heating units is used, after reducing the voltage to 6, 8, or 14 volts, to operate the relay. The apparatus is simple, comparatively cheap, and needs little attention after being set up and adjusted. It will stand continuous service for long periods of time, and when used in connection with a toluol and mercury filled tube controls temperatures within a range of 0.25° F.

Growth of plants in artificial light, R. B. Harvey (*Bot. Gaz., 74 (1922), No. 4, pp. 447–451, figs. 2*).—"A great variety of plants, including wheat, oats, barley, rye, flax, buckwheat, white sweet clover, peas, beans, lettuce, and a number of common weeds were grown from seed to maturity in continuous artificial light, and all set good seed. Potatoes, tomatoes, red clover, alsike clover, squash, and Silene bloomed, but did not set seed. Potatoes produced tubers of good size. All of the plants tested did not require a certain period of illumination to cause them to bloom. It is possible to produce seed from plants in winter independent of sunlight, and at no very great expense."

The action of ultraviolet light on the yeastlike fungi, I, B. Feuer and F. W. Tanner (*Jour. Indus. and Engin. Chem., 12 (1920), No. 8, pp. 740, 741, figs. 2*).—"From the data obtained it is evident that yeast cells are not very resistant to ultraviolet light. Possibilities are seen for the use of ultraviolet light in controlling the development of yeast cells in the industries. Further work is planned to obtain quantitative data and study the effects of the light on the cells suspended in a variety of media."

The action of ultraviolet rays on the Saccharomycetes, R. de Fazi (*Jour. Indus. and Engin. Chem., 13 (1921), No. 3, p. 265*).—The author, referring to the above statements by Feuer and Tanner, and indicating some results from his own work previously noted (E. S. R., 37, p. 314), states that he exposed brewers' yeast for 12 hours to the ultraviolet rays from a 1,200-candlepower lamp at a distance of 20 cm., and that not only was the yeast uninjured by this treatment but its fermentative activity was actually increased. All the bacteria present in the yeast were destroyed after a brief exposure. He cites other facts and other observers supporting his findings.

[Reply to De Fazi], B. Feuer and F. W. Tanner (*Jour. Indus. and Engin. Chem., 13 (1921), No. 3, pp. 265, 266*).—It is claimed to be impossible for yeasts (Saccharomycetaceae) to endure direct continuous exposure, at a distance of 20 cm., to the ultraviolet rays emitted from a 1,200-candlepower lamp for from 12 to 14 hours.

Action of ultraviolet light on yeastlike fungi, II, F. W. Tanner and E. Ryder (*Bot. Gaz., 75 (1923), No. 3, pp. 309–317, fig. 1*).—In order to test more fully the validity of the claims made by Feuer and Tanner as noted above, the former project has been continued with apparatus and precautions which are here described.

No evidence was secured to show that yeast cells possess any marked resistance to ultraviolet rays. They lived a few seconds or minutes longer than bacteria, but this is supposedly explained by the difference in size. Pigmented yeasts are more resistant than white yeasts, supposedly due to the resistance to penetration of the rays. Exposure of contaminated yeast cultures to ultraviolet rays did not increase their fermenting abilities.

The data presented herewith indicate a direct relation between the size of the cell and its resistance to ultraviolet rays.

Determination of moisture content of expressed plant tissue fluids, R. A. GORTNER and W. F. HOFFMAN (*Bot. Gaz., 74* (*1922*), *No. 3, pp. 308-313*).—Throughout the extensive work of J. A. Harris and his associates it has been recognized that a knowledge of the moisture content of the expressed plant saps would be most desirable. The attempt is outlined to determine the moisture content by making use of the refractive index of the plant sap, a method which has been employed by sugar manufacturers for many years, refractometers being now purchasable which have a special sugar scale from which the percentage of a sugar in a sirup may be read directly. Use was made of a high grade Abbé refractometer, provided with a special sugar scale and carefully standardized by the U. S. Bureau of Standards, determinations with which were obtained on a series of plant saps with results which are shown in tabular form.

The tissue fluids were obtained by means of a specially constructed press bowl and a hydraulic press after the tissue had been rendered permeable by a preliminary freezing of the tissue for at least eight hours, following the procedure which is indicated as used in previous work.

One advantage of the proposed method is that only two or three drops of sap are required for the determination, and another is that the entire procedure need not take more than two minutes. It is believed that the refractometer reading more nearly expresses the true value of the moisture content than can be obtained by any other known method.

A method for estimating hydrophilic colloid content of expressed plant tissue fluids, R. NEWTON and R. A. GORTNER (*Bot. Gaz., 74* (*1922*), *No. 4, pp. 442-446, fig. 1*).—In the above paper by Gortner and Hoffman it was pointed out that studies of the physico-chemical properties of plant saps which include only measurements of the osmotic pressure, electrical conductivity, and H-ion concentration, leave out of account the very important influence on physical properties exerted by sap colloids. By the introduction of the refractometer as a part of the field laboratory equipment it has been proved possible to make rapid and accurate determinations of the moisture content of the plant saps. Utilizing the additional data thus made available, a simple method has been devised which appears to give a relative measure of the content of hydrophilic colloids, and data are presented as obtained from the work illustrating the use of this method.

"Conditions of equilibrium, and possible errors due to adsorption of the sugar by colloids, have not yet been investigated. The data already secured, however, appear to justify the proposal of the method for the estimation of the relative (not absolute) content of hydrophilic colloids in expressed plant tissue fluids. It seems probable that the method may be applied also to other biological fluids."

Permeability of the cell to electrolytes, O. RABER (*Bot. Gaz.,* (*1923*), *No. 3, pp. 298-308*).—"The effects of a salt upon the permeability of Laminaria may be predicted according to the following rule. Neutral salt solutions of the same osmotic pressure and conductivity as sea water cause an initial decrease in permeability, followed by an increase if the valency of the cation is greater than that of the anion. They cause an increase in the permeability from the start if the valency of the cation is less than that of the anion. If the two are of the same valency, the effect will depend upon the relative size of the ions and the density of the accompanying electric charges.

"A hypothesis is proposed to explain the observed phenomena which may be summarized as follows: (1) Permeability is due to the electrical condition of the semipermeable membrane, which in Laminaria is negatively charged when in sea water. (2) A solution in which the cation carries the more dense charge, a 'positive' salt, alters the charge on the membrane and decreases the permeability. As more of the salt diffuses in, the negative charges on the membrane are replaced by positive charges, the effect is reversed, and the permeability increases. Acids are 'positive' electrolytes. (3) A solution of a salt in which the anion carries the more dense charge, or in which the charges are approximately equal on the two ions, a 'negative' salt, increases the negative charge on the membrane and increases the permeability, which continues until the death of the tissue. (4) Antagonism exists between those salts which produce dissimilar electrical effects upon the protoplasm."

Protein synthesis in Chlorella, W. C. MUENSCHER (*Bot. Gaz., 75 (1923), No. 3, pp. 249–267, figs. 2*).—In experiments on the nutrition of several species of Chlorophyceae growing in pure cultures in the absence of light, the author observed that some species made a considerable growth in solutions containing glucose and apparently no source of nitrogen other than that supplied in an inorganic form, such as calcium nitrate or ammonium sulphate. The investigation here reported was undertaken to obtain definite quantitative data as to whether or not green plants can, under certain conditions, utilize inorganic nitrogen for protein synthesis in the absence of light.

One of the unicellular Chlorophyceae, *Chlorella* sp., was grown in pure culture in a nutrient solution to which combined nitrogen was supplied in inorganic combination, either as calcium nitrate or ammonium sulphate. After cultures had been grown in diffuse light and in the absence of light for 105 or 235 days, quantitative determinations were made of the volume, dry weight, and total nitrogen content of the growth obtained. The data obtained offer strong evidence indicating that *Chlorella* sp. can synthesize proteins in total darkness when nitrogen is supplied in inorganic combination. No evidence of free nitrogen fixation by *Chlorella* sp. was obtained.

Carotinoids and related pigments, the chromolipoids, L. S. PALMER (*New York: Chemical Catalog Co., Inc., 1922, pp. 316, pls. 2, figs. 2*).—The present monograph treats of pigmented substances having a yellow, yellow-orange, orange, red-orange, and red color. These pigments are widely distributed in every stage of living matter and are perhaps more frequently encountered than any other class of natural pigments. The author favors Tswett's terminology of carotinoids for these pigments. From the standpoint of phytochemistry there is definite evidence for the existence of five carotinoids, with indications that several others also occur.

The author has had three main ideas in mind in preparing this monograph. First, he has attempted to compile a thorough history of the development of the chemistry of the plant and animal chromolipoids. Second, he has tried to present such information regarding the pigments as would be useful to workers desiring to attack problems in this branch of plant and animal chromatology. Third, he has made an effort to point out lines of reseach which might prove attractive to those interested in this subject. The several chapters deal with the distribution of carotinoids in the phanerogams, cryptogams, vertebrates, and invertebrates, with chemical and biological relations between plant and animal carotinoids, methods of isolation, properties, and identification, quantitative estimation, and function of carotinoids. An extensive bibliography is followed by an author index and a subject index.

Physiological studies of effects of formaldehyde on wheat, W. M. Atwood (*Bot. Gaz., 74 (1922), No. 3, pp. 233–263, figs. 12*).—Tests of formaldehyde entry into wheat have been made. Microchemical tests and imbibitional studies indicate that formaldehyde slowly enters through the seed coat, that diastatic activity of the grain is retarded, that respiration is slowed down, and that catalases are reduced in their ability to break down peroxids. A previous account of this work has been noted (E. S. R., 48, p. 127).

GENETICS.

The centenary of Gregor Mendel and Francis Galton (*Sci. Mo., 16 (1923), No. 3, pp. 225–268*).—The four following papers were presented in honor of the centenaries of the birth of Mendel and Galton at the meeting of the American Society of Naturalists at Boston in 1922:

Mendel and his contemporaries, E. M. East (pp. 225–237).—This paper deals mainly with the methods of hereditary research employed by Mendel and his contemporaries. Methods used by biologists of his time are given as the explanation of the nonacceptance of his work at that time, it being stated that his papers were published in an available journal.

The bearing of Mendelism on the origin of species, T. H. Morgan (pp. 237–247).—The author discusses the similarity in the chromosome numbers, location of genes, and mutations occurring in related species with reference to their bearing on evolution.

Galton and Mendel: Their contribution to genetics and their influence on biology, J. A. Harris (pp. 247–263).—This is a brief comparison of the lives, opportunities, and accomplishments of Mendel and Galton. Mendel was educated with difficulty, depended on the results of his experiments for his observations, and published little, whereas Galton was carefully trained, was able to make world-wide observations, and published many papers not only on biology but in astronomy and other fields. Instead of giving a comparison between the importance of the work of each, the author states that "both men worked in advance of the science of their own generation. Both have influenced in a profound and far-reaching manner the science of subsequent generations."

A permanent memorial to Galton and Mendel, G. H. Shull (pp. 263–268).—The author describes the purpose of the "Galton and Mendel memorial fund," which is to establish a fund from which the income may be used for special engraving and the presentation of statistical information in the journal *Genetics*. He considers this a fitting memorial to the founders of biometry and Mendelism.

Outline of genetics, with special reference to plant material, M. C. Coulter (*Chicago: Univ. Press, 1923, pp. VII+211, figs. 31; rev. in Bot. Gaz., 75 (1923), No. 4, pp. 427, 428*).—The present text is more than a new edition of the earlier one (E. S. R., 40, p. 817), since it represents a thorough revision of the material presented. The subject is claimed to be brought more nearly up to date than in any earlier text. An arrangement (in typography) of material is made by means of which it may be used either as an elementary text or as one somewhat more advanced.

Further investigations with speltoid mutations [trans. title], E. LINDHARD (*Hereditas, 4 (1923), No. 1-2, pp. 206-220*).—In a further contribution (E. S. R., 49, p. 335), the author states that heterozygous speltoid mutants, which appear among offspring of the normal type, may give rise to compactum heterozygotes. In the progeny of the latter Squarehead heterozygotes appear. Among these heterozygotes the normal, speltoid, and compactum types form a kind of triangle not explainable by mutiple allelomorphism, since the hybrid between any two of the three types can segregate the third in heterozygous condition. Preliminary cytological studies by Ø. Winge suggest that the Squarehead heterozygote and the compactum heterozygote have 41 instead of 42 chromosomes in the somatic cells. Accordingly the compactum gamete should contain only 20 instead of 21 chromosomes and consist of a speltoid gamete lacking a certain chromosome.

Compactum heterozygotes, which are heterozygous in the factor for awns also, segregate awned and awnless offspring in different ratios from the two crosses, awnless compactum×awned normal and awned compactum×awnless normal types. The linkage seen here between the factor for awnlessness and the absence of 1 chromosome could probably be explained in accordance with the behavior of Blakeslee's purple-white poinsettia mutant of *Datura stramonium* (E. S. R., 44, p. 327).

A preliminary note on a sterile dwarf rogue in Sea Island cotton, L. H. BURD (*Empire Cotton Growing Rev., 1 (1924), No. 1, pp. 46-48, figs. 8*).—A rogue seen growing among the pure strain of Sea Island cotton (V. 135), evidently not the same as that noted by Harland (E. S. R., 37, p. 224), was very much reduced in height and the size of the parts, but otherwise differed little from the normal Sea Island type. Most of the leaves were three-lobed and very clearly and deeply cut. The bracts and flowers were small but typically Sea Island in their proportions. The plant shed its bolls to an alarming degree and, probably therefore, continued flowering very late into the season. Normal dehiscence of the anthers did not seem to occur, and the pollen was found abnormal. A preliminary examination of the pollen formation strongly indicates a disturbance of the chromosome mechanism in the heterotype and homotype divisions. The tetrad formation appears highly abnormal, any number up to seven cells being visible instead of the usual four. A possibility of mutational origin is indicated.

The origin of cyclopean monsters, F. E. CHIDESTER (*Amer. Nat., 57 (1923), No. 653, pp. 496-518*).—After a review of previous papers dealing with the occurrence of Cyclopeans in mammals, birds, fishes, and the flatworm, the following theoretical causes of mammalian Cyclopeans are discussed: Mechanical theory, diseases of the fetus, maternal diseases, pathology of the germ, and drugs and anesthetics. The author concludes that the operation of chemical or physical agents just before the optic vesicles are pushed out probably cause Cyclopeans. Disturbances of the mother's metabolism as the result of abnormalities in hormones secreted may also be a contributing cause. A very extensive bibliography accompanies the work.

Seed color inheritance in certain grain sorghum crosses, J. B. SIEGLINGER (*Jour. Agr. Research [U. S.], 27 (1924), No. 1, pp. 53-64*).—Crosses between different varieties of grain sorghums were made at the Woodward, Okla., Field Station, and some were grown through the F_3 generation and others through the F_2 generation.

Crosses between feterita or Blackhull kaoliang and Sunrise kafir produced F_1 plants with light brown seeds having a brown nucellar layer. Seeds of feterita and Blackhull kaoliang are a chalky opaque white and have a well-developed brown nucellar layer lying directly outside of the aleurone layer, while seeds of Sunrise kafir are creamy white with a smooth or glossy pericarp but have no brown nucellar layer. The seed colors of the three phenotypes segregating in the F_2 of these crosses were brown seeds with brown nucellar layer, white seeds with brown nucellar layer, and white seeds with no brown nucellar layer, in a ratio of about 9:3:4. The two-factor hypothesis of color inheritance in these crosses was confirmed by results in the F_3 generation.

Red kafir seed is of a dark red color with no brown nucellar layer. Feterita×Red kafir produced a reddish brown kernel with brown nucelar layer in the F_1 generation. In the F_2 of feterita×Red kafir, four phenotypes were obtained, brown with brown nucellar layer, white with brown nucellus, red and pink with no brown nucellus, and white with no brown nucellus, in about the ratio of 45:3:12:4, indicating that three main factors influenced the inheritance of seed color in this cross. In Sunrise kafir×Red kafir and White kafir×Red kafir the F_2 segregated in a simple monohybrid ratio of three red-seeded plants to one white-seeded plant. Crosses between White kafir and Sunrise kafir indicated that the seed color of these two varieties is genetically identical.

The factors concerned in the inheritance of seed color in these sorghum crosses are *B* for brown nucellar layer, which produces brown color in the epidermis in the presence of *S*; *b*, giving no brown nucellar layer when homozygous; *S*, causing the development of color in the epidermis of the seed; *s*, when present in the homozygous condition preventing the development of the brown color in the epidermis; *R* for dark red, when present causing the development of red color in the epidermis; and *r*, absence of red color. The factorial constitution of feterita and Blackhull kaoliang with respect to seed color is *BBssrr*, of Sunrise and White kafir *bbSSrr*, and of Red kafir *bbSSRR*.

Some observations on Mendelian characters in sorghum, V. RAMANATHAN (*Jour. Madras Agr. Students' Union, 12 (1924), No. 1, pp. 1–17, figs. 5*).—Studies were made on Irungu and Tellajonna varieties of sorghum at the Hagari, Madras, experiment station during the years 1916–1920. The course of pollination in sorghum is traced. The frequency of cross-pollination is noted, and a method of selfing is described.

Several factors seem to be involved in the production and distribution of hairs on the glumes. Dense felting behaves as a dominant with regard to "no hairs." The hairy plants may be detected by the belt of hairs above the nodes, noticeable long before the exsertion of the heads. Red coloration of glumes behaves as a dominant to black, wrinkled glumes to unwrinkled, short awns to long awns, open heads to compact heads, and red color of grains to white, with segregation in 3:1 ratios in the F_2.

Linseed (Linum usitatissimum) hybrids, R. J. D. GRAHAM and S. C. ROY (*Agr. Jour. India, 19 (1924), No. 1, pp. 28–31*).—Flax hybrids involving blue and white flowers and yellow, dark brown and pale brown seeds were studied on the College Farm, Nagpur, Central Provinces. There appeared to exist a factor for petal color in whose absence the petals are white, and a factor for seed-coat color in the absence of which the seeds are pale brown. If the factor for petal color is absent, however, the seeds are yellow. The oil content of the seed of white-seeded selections averaged 41.37 per cent, and of the dark-seeded selections 38.62 per cent. However, the acre yield of blue flaxes with dark seeds was distinctly higher than that of those with white flowers. Cases of natural hybridization in flax in India are noted.

Body build and its inheritance, C. B. DAVENPORT (*Carnegie Inst. Wash. Pub. 329 (1923), pp. VI+176, pls. 9, figs. 53; abs. in Soc. Expt. Biol. and Med. Proc., 20 (1923), No. 7, pp. 388–390, fig. 1*).—This study of body build, its development, and inheritance in humans consists of three parts.

I. *Build, its definition and its ontogeny.*—The author discusses differences occurring in the build of people of different sexes and different races. Data from various sources to show the changes during growth in body build, as measured by chest girth ÷ stature, indicated that this ratio was greatest at birth, with a rapid decrease to 12 years of age, followed by a slow increase to 30 years and a very slow increase to 55 years of age. The very short leg length of infants is responsible for the high ratio at birth.

II. *Mass studies in heredity of adult build.*—The material for this study was obtained from the records of families, collected at the Eugenics Record Office, and by special correspondence and visits upon individuals. The index of adult build, which was found to show the smallest standard deviation and which it was possible to determine from the records, was found to be the weight in pounds÷stature in inches squared. To avoid decimals this quotient was multiplied by 1,000. For a study of the variation in the index of build, it was found convenient to divide the population into five classes, which were arbitrarily chosen, having the following ranges of indexes: Very slender (VS) 20 to 25.4, slender (S) 25.5 to 30.4, medium (M) 30.5 to 36.4, fleshy (F) 36.5 to 43.4, and very fleshy (VF) 43 to 64 +.

In studying the relation of disease occurrence to the build of individuals, it was found that certain classes were more susceptible to certain types of diseases than other classes, though no single disease or collection of diseases seemed to be responsible for the production of any type of build, build being attributed to idiosyncrasies of development and metabolism, largely affected by heredity, and possibly modified by other conditions. The following table shows the distribution of the progeny of parents of different builds, together with the average index of build for the parents and offspring:

Build of offspring produced by parents of various types.

Type of mating.	Number of matings.	Average progeny per mating.	Average build of parents.	Average build of progeny.	Distribution of progeny. Absolute numbers.				
					VS.	S.	M.	F.	VF.
		Number.	*Index.*	*Index.*					
VS×S	4	2.75	26.13	28.55+0.86	4	12	2	2	......
VS×M	8	3.50	28.38	32.18+ .54	1	7	17	3	......
VS×F	5	5.00	32.00	35.04+ .83	1	5	10	7	2
S×S	23	2.04	29.77	28.47+ .24	5	35	11	......	......
S×M	101	3.03	30.90	34.01+ .16	......	49	200	53	11
S×F	49	3.16	33.85	34.39+ .22	5	25	85	57	7
S×VF	11	3.09	37.91	35.48+ .51	......	7	18	17	8
M×M	92	3.55	33.23	34.79+ .15	2	40	201	82	7
M×F	114	2.98	36.45	35.41+ .16	......	31	210	88	17
M×VF	30	3.70	40.68	36.53+ .38	2	7	50	36	17
F×F	33	4.72	39.21	37.56+ .29	......	15	62	61	21
F×VF	30	3.45	42.97	38.49+ .36	1	7	52	51	35
VF×VF	7	4.29	47.43	39.20+ .78	......	......	12	8	10

A study of the matings between the different classes and the classes and variability of the offspring indicated that multiple factors determine body build, those making for fleshiness being incompletely dominant to those for slenderness. Further observations were made on the tendency of people of similar build to mate, which was slightly greater than in the case of persons of dissimilar build.

III. *Family studies in heredity of build.*—For this part of the work individual families on which sufficient data were available have been classified as matings in which both parents were slender or fleshy, matings between slender and fleshy parents, and matings of heterozygous parents and back-crosses. Detailed descriptions of each family are given. In summarizing the results of these matings, differences in metabolism of individuals were suggested as producing the variations in build. Examples were cited where two individuals consuming similar amounts of food developed into widely different types. The operation of the endocrine organs, especially the thyroid and pituitary glands, is mentioned as an important factor affecting metabolism.

The author suggested that the segregations observed in some families indicated a two-factor hypothesis, whereas in others a three-factor hypothesis was suggested, with fleshiness incompletely dominant in all cases. The author intimates that one factor may cause hypothyroidism, another hypopituitarism, whereas the third may inhibit the normal development of genitalia as occurs in distrophia adiposo-genitalis.

Experiments with tobacco hybrids in the Departments of Lot and Isère, France [trans. title], J. B. JEHAN (*Mém. Manfr. État, Tabacs—Allumettes, 5 (1923), No. 2, pp. 125–160*).—Hybrids between a number of native and exotic varieties of *Nicotiana tabacum* were studied from 1912 to 1914. F_1 hybrids generally showed intermediacy between their two parents, except in several cases an intensification of a character was seen or where one of the characters of one parent completely masked the corresponding character of the other. Several of the F_2 progenies are described, the behavior in F_2 of Burley×*N. purpurea* being treated in some detail. Observations in 1921 on F_2 and F_3 progenies and in 1922 on F_3 and F_4 generally confirmed the earlier work and demonstrated the existence in F_2 of constant individuals whose offspring were uniform. Modern ideas on hybridization and the theories developed at Svalöf are reviewed.

A few observations on paddy (Oryza sativa) crossing, S. G. SHARNGAPANI (*Agr. Jour. India, 19 (1924), No. 1, pp. 48–50, fig. 1*).—A method for hybridizing rice is described and illustrated.

Improving cane by bud selection, A. D. SHAMEL (*Sugar [New York], 25 (1923), Nos. 3, pp. 140, 141; 4, pp. 200–202*).—Bud selection is indicated as the agency through which bud variations are perpetuated and used in plant improvement work, and instances are cited of valuable varieties of crops and fruits originating in bud mutations. Attention is called to probable bud variations appearing in sugar cane, in studies by the Hawaii Sugar Planters' Experiment Station.

Selection in broomcorn, J. B. PARK (*Jour. Heredity, 14 (1923), No. 5, pp. 213–219, figs. 3*).—Experiments reported from the Ohio State University concerned the inheritance of central stem in broomcorn and the possibility of its reduction or elimination by selection.

Head-row populations, grown from open-pollinated Longbrush Evergreen seed, showed often a decided family resemblance within the head-row and conspicuous differences between rows. The degree of uniformity within a head-row, on the whole, was decidedly greater than usually occurs in ear-rows of corn, except after inbreeding, indicating that considerable self-pollination occurs naturally in broomcorn. The existence of complete self-fertility was shown. While seasonal conditions had a pronounced effect on the amount of central stem and upon length of brush, the relative positions of the strains were fairly well maintained and all the strains and varieties showed about the same kind and degree of response to seasonal influences. Central stem in broomcorn appears to be an inherited character, for different strains produce it in differing amounts. However, none has been found producing a progeny free from this undesirable feature. Possibly multiple factors are concerned. Production of central stem seems to be closely tied up with the physiological condition of the plant.

The threshold of fertility in rats and its relation to diet deficiency, D. MACOMBER (*Amer. Nat., 57 (1923), No. 653, pp. 519–531*).—By remating rats which proved sterile in the studies of the relation of dietary deficiencies to sterility (E. S. R., 46, p. 261) with other highly fertile rats, it was found that both of the rats of 37 sterile matings produced young. In explanation of these results, the author suggested the hypothesis "that the fertility of a mating could be expressed as the product of the fertility of the individuals concerned, and that if this mating fertility were below a certain level which we called the 'threshold for reproduction' no young would result, but that if it were above this level the mating would be positive."

The mating records of 1,381 rats from W. E. Castle's stocks on stock diets and those inbreds which received the stock diet and deficient diets as adults, and those which were raised on deficient diets, were classified according to their percentage fertility, based on the proportion of matings with different animals which were fertile. A study of the individual matings indicated that usually where the product of the fertility of the male by the fertility of the female was greater than 50 per cent, the mating was fertile, and the reverse was equally true. Fifty is, therefore, taken as the threshold of fertility.

FIELD CROPS.

Adjusting yields to their regression on a moving average, as a means of correcting for soil heterogeneity, F. D. RICHEY (*Jour. Agr. Research* [*U. S.*], *27 (1924), No. 2, pp. 79–90, figs. 2*).—The adjustment of yields to their regression on a moving average as a means of correcting for soil heterogeneity is discussed in this contribution from the Office of Cereal Investigations, Bureau of Plant Industry, U. S. D. A. The planting arrangement employed to illustrate the method used has been detailed in U. S. D. A. Bulletin 1209 (E. S. R., 50, p. 830). The fundamental concepts on which the method proposed by the author is based are as follows:

The mean yield of any one seed class is a fair measure of its productiveness. The deviations of the individual replicates from this means are due in part to soil variation. Deviations of the yields of successive groups of contiguous rows from the computed production of an equal number of average rows of similar kind are due in part to soil variation. The correlation of the percentage yields of such groups with the percentage yields of the individual rows upon which the groups are centered measures their tendency to concomitant response to the soil variation.

Experimental methods with special reference to uniformity of descriptive terms, G. P. MCROSTIE (*West. Canad. Soc. Agron. Proc., 3 (1922), pp. 85–91*).—Standard descriptive terms are suggested for records on crop plants.

Report of the committee of standardization of descriptive terms used in field experimental work, L. E. KIRK (*Sci. Agr., 4 (1924), No. 8, pp. 242–246, fig. 1*).—This report, adopted at the meeting of the Western Canadian Society of Agronomy, at Edmonston, Alta., December 28, 1923, comprises a revised list of descriptive terms used in field experimental work and based on the above paper.

Methods now in use in cereal breeding and testing at the Cornell Agricultural Experiment Station (in cooperation with the U. S. Department of Agriculture), H. H. LOVE and W. T. CRAIG (*Jour. Amer. Soc. Agron., 16 (1924) No. 2, pp. 109–127, figs. 7*).—This is a revision of an earlier paper (E. S. R., 40, p. 232).

Handbook of cereal culture, F. SCHINDLER (*Handbuch des Getreidebaus. Berlin: Paul Parey, 1923, 3. ed., rev. and enl., pp. XVI+530, figs. 130*).—A revised and enlarged edition of the volume noted heretofore (E. S. R., 47, p. 828).

Legume seed treatment to decrease hard seed content, D. SCHMIDT (*Seed World, 15 (1924), No. 6, pp. 22, 23, figs. 2*).—Exposure of seed of red clover, Hubam sweet clover, and alfalfa to live steam for 1, 1.25 and 1 minute, respectively, at the University of Wisconsin is reported to have resulted in respective increases in germination of 20, 33, and 44 per cent. The increase was probably due to a softening of hard seeds or rendering certain seed coats permeable. The increase in dead seeds due to treatment was slight.

The forage problem (*Jour. Amer. Soc. Agron., 16 (1924), No. 3, pp. 153–238*).—The symposium on the forage problem at the meeting of the American Society of Agronomy, held at Chicago in November, 1923, included the following papers:

The Larger Aspects of Our Forage Supply, and The Possibilities in New Forage Plants, both by C. V. Piper; Fertilizing Timothy and Calculating Financial Returns, by A. F. Gustafson; Problems of Alfalfa in the East, by J. F. Cox; The Growth of Alfalfa with Various Cutting Treatments, by L. F. Graber; Legumes for Acid Soils, by C. F. Leach; Clover Problems, by A. J. Pieters; Sweet Clover as a Hay Crop, by H. L. Walster; Some Silage Problems, by R. A. Oakley; The Problem of Tame Grass Pastures in the Humid North, by L. Carrier; The Problem of Improving Western Ranges, by J. T. Jardine; The Problem of Systems of Grazing, by W. C. Barnes; The Problem of Pastures in Semi-waste Lands of New England, by S. B. Haskell; The Problems of Pastures in the Semi-waste Lands of the Southern Coastal Plain, by J. R. Fain; The Better Utilization of Straws, by C. E. Leighty; The Future of the Soy Bean as a Forage Crop, by J. C. Hackleman; and The Problem of Forage Crops in Relation to Soil Improvement, by C. A. Mooers.

Improvement of grazing areas in the Bombay Presidency, L. B. KULKARNI (*Bombay Dept. Agr. Bul. 112 (1923), pp. 53, pls. 7*).—Extensive trials proved the great difficulty of establishing grass areas with single good grasses in the conditions of western India, even on excellent soils like the black alluvial land at Surat and the black soils at Dharwar and Kopargaon. In experiments with grasslands with mixed herbage during five years, the introduced annual grasses and legumes took precedence and produced a heavy yield but gradually disappeared from the plats as the introduced perennial grasses became established. *Andropogon contortus*, an inferior but prominent grass in the plats before the tests, was gradually suppressed partly by the cultivation given and partly by the quick growing introduced annual grasses and legumes. The introduced perennial grasses after their complete establishment gave yields good in both quality and quantity, even under adverse conditions. *Ischaemum sulcatum*, a quick growing and drought resistant annual grass, was found suitable for mixture with perennial grasses in farming permanent grassland. Grazing before the introduced perennial grasses were completely established was found very harmful.

The characteristics of *A. monticola*, *A. pertusus*, *A. caricosus*, *A. purpureo-sericeus* (E. S. R., 46, p. 30), *A. contortus*, and *I. sulcatum* are summarized. Practices are suggested for reseeding grassland and the management of a reseeded grazing area.

Methods of conducting grazing experiments [trans. title], C. A. G. CHARPENTIER (*Lantbr. Styr. Meddel.* [*Finland*], *No. 151 (1923), pp. 20–27*).—A discussion is presented of the methods and plans for studying problems relating to the grazing industry, the factors influencing the yield of grazing areas are mentioned, and means for determining the yielding capacity of such areas are suggested. Methods for making botanical analyses of grazing lands, proposed by different investigators, are compared, and the cost of establishing a grazing enterprise, the value of grazing resources in animal production, and the capacity of livestock to utilize pastures are considered.

The meadow and pasture resources of Finland [trans. title], C. A. G. Charpentier (*Lantbr. Styr. Meddel.* [*Finland*], *No. 151* (*1923*), *pp. 7–19*).—This article considers the general requirements for the establishment of a profitable grazing industry and the extent to which these requirements are met by conditions in Finland. The types of soil and areas adapted to grazing, the species of pasture grasses prevailing, the climate, including the length of the growing season, and the amount and distribution of precipitation, and various other factors with a bearing on the subject are discussed. Suggestions are given as to plans and methods of conducting investigations for the solution of pasture and grazing problems in Finland.

Emergency hay crops, G. B. Mortimer (*Wisconsin Sta. Bul. 359* (*1924*), *pp. 16, figs. 5*).—Cultural and field practices, varieties, and environmental needs are discussed for growing oats and peas, Sudan grass, Sudan grass and soy beans, millets, and soy beans for hay. The culture of Sudan grass for pasture, for seed, and as a smother crop is also outlined. Experimental work supporting the recommendations has been noted elsewhere (E. S. R., 49, p. 629).

Experiments with bright tobacco and other crops grown on bright tobacco farms, T. B. Hutcheson and D. J. Berger (*Virginia Sta. Bul. 233* (*1923*), *pp. 19, fig. 1*).—The results of the experiments completed at the tobacco experiment station in Pittsylvania County are summarized, together with outlines of systems of farming and general treatments for soils and crops in the bright tobacco section, as suggested by the experimental work. The outstanding varieties of corn, wheat, oats, rye, cowpeas, soy beans, potatoes, and sweet potatoes are indicated with comparative yields. The soil on which these experiments were conducted was classified as Cecil gravelly fine sandy loam. Earlier work has been noted (E. S. R., 27, p. 437).

A complete fertilizer was found to give much better results with tobacco than any of the incomplete fertilizers, and acid phosphate gave the highest acre value of the single element carriers. Attempts to improve on the standard 3–8–3 formula for bright tobacco were without success. Increases in yield and quality of leaf followed the use of heavy applications of fertilizers, as much as 1,400 lbs. per acre of 3–8–3 appearing profitable on this soil.

Returns from tobacco were less on limed plats, whereas for other crops, such as wheat, hay, and corn, commonly grown on tobacco farms, lime was very beneficial. Observations on the residual effect on corn, wheat, and hay of fertilizers applied to tobacco showed all treatments to be unprofitable except those including phosphoric acid.

The increased yields on the phosphorus plats showed strikingly the absolute need of phosphoric acid for this soil for the economical production of both grain and hay.

Different rotations are advised for tobacco and for grain and forage crops on bright tobacco farms. The tobacco rotation should not include legumes and the soil should not be limed, whereas the grain and hay rotation should include legumes as often as practicable and lime should be applied at least once in six years.

Warne and Gold Leaf, broadleaf varieties, have given highest average yields and selling prices during three years, although Adcock and Flanagan, narrow-leaved sorts, are also among the most popular varieties in the Virginia bright tobacco belt.

Report on the activities of the Zealand Agricultural Society in the promotion of plant culture prior to 1923, L. RASMUSSEN (*Oversigt over de Sjaellandske Landboforeningers Virksomhed for Planteavlens Fremme indtil Aaret 1923. Copenhagen: August Bangs Boghandel, 1923, pp. 360, pl. 1*).—The work for the 25 years ended with 1922 is reviewed to mark the twenty-fifth anniversary of the organization of the society. The numerous results presented and briefly discussed were derived mainly from local and cooperative fertilizer and cultural tests with the common field crops, including lupines, peas, clover, alfalfa, black medic, wheat, oats, barley, rye, hemp, potatoes, grasses, and beets. The work reported includes also tests in weed control and experiments on the effect of ordinary salt when applied to soils growing mangels and sugar beets.

[Field crops work of the Agricultural Research Institute, Pusa, 1922–23], A. and G. L. C. HOWARD and W. SAYER (*Agr. Research Inst., Pusa, Sci. Rpts., 1922–23, pp. 10–18, 76–84, 108–115, pl. 1*).—The continuation of earlier experiments is reported on (E. S. R., 48, p. 732). In an account of the activities of the Sugar Bureau, the merits of Coimbatore seedling sugar canes are discussed in some detail.

Report on the experiments on the influence of soil, season, and manuring on the quality and growth of barley as indicated by the malts made therefrom, H. M. LANCASTER (*Jour. Inst. Brewing, 30 (1924), No. 3, pp. 162–181*).—The tabulations, which supplement a report by Russell (E. S. R., 50, p. 233), show without comment the malting values of barley grown under different fertilizer treatments and soil conditions.

Clover seeds: Economic species of the genus Trifolium in New Zealand, N. R. FOY (*New Zeal. Jour. Agr., 28 (1924), No. 1, pp. 11–21, figs. 21*).—Species of Trifolium described and illustrated, with notes on germination, purity, adulteration, and origin, include white clover, alsike, red clover, crimson clover, subterranean clover, strawberry clover, and Egyptian clover. Sub-economic species touched on are *T. dubium*, *T. glomeratum*, rabbit-foot clover, and low hop clover.

Anchorage and extent of corn root systems, J. R. HOLBERT and B. KOEHLER (*Jour. Agr. Research [U. S.], 27 (1924), No. 2, pp. 71–78, pls. 5, fig. 1*).—Significant differences in the root systems of several inbred strains of corn are pointed out, with a description of a machine designed for plant pulling.

The mean resistance to a vertical pull of plants of a good strain was 29.8±1.8 lbs., of a strain susceptible to root rot 13.8±1.1, and susceptible to leaf firing 9.1±0.9 lbs. The F_1 hybrids between the good strain and the other strains were somewhat more vigorous than the good inbred strain as measured by vegetative growth, but they were not superior in pulling resistance. These and other data are held to indicate that the genetic factors responsible for the reduced root systems in the strains susceptible to root rot and leaf firing, respectively, are recessive. Erect plants of a good strain were better anchored than erect plants of a strain susceptible to root rot. As the mean pulling resistance of erect plants decreased, the percentage of leaning plants increased.

Plants of the strains susceptible to root rot or to leaf firing had significantly fewer main roots than plants of the good strain, while no real difference was noted in mean plant height of the three strains. Plants of the good strain were also far superior in the number and length of lateral roots. Other comparisons confirmed the merits of the good strain. Preliminary histological studies indicate that a considerable difference exists between the roots of the good strain and the strain susceptible to root rot in the morphology of the cells themselves, which may account for some of the desirable qualities of the good strain.

Cotton growing in Illinois, J. A. Evans, J. C. Hackleman, and F. C. Bauer (*Illinois Sta. Circ. 279 (1924), pp. 8, figs. 2*).—Practical suggestions are made for prospective cotton growers in southern Illinois.

The Texas Station plan of cooperative distribution of pedigreed cotton seed, G. N. Stroman and D. T. Killough (*Jour. Amer. Soc. Agron., 16 (1924), No. 2, pp. 127-130*).—The method used in the distribution of a strain of pedigreed cotton seed, developed by the Texas Experiment Station, through a cooperative organization of farmers, is outlined.

Treatment of cotton seed with superphosphate paste, W. R. Watkins (*Agr. Gaz. N. S. Wales, 35 (1924), No. 1, p. 10*).—Although planting was facilitated by treating cotton seed with superphosphate paste at the Grafton, N. S. Wales, Experiment Farm, germination was affected adversely, the paste setting very hard and apparently hardening the seed case. Most of the seedlings in the treated plat appeared withered and with a yellowish tinge on the young leaves.

Some tensile properties of cotton yarn, T. Fuwa (*Abs. in Color Trade Jour., 13 (1923), No. 4, p. 117*).—The effect of important variables such as moisture content, temperature, prolonged heating, and lubrication upon the tensile properties of cotton yarn was studied, employing two varieties of cotton and apparatus permitting of close temperature and humidity control.

Up to about 12 per cent of moisture tensile strength was found to increase, and beyond this point even soaking in water produced no further increase in strength. Increase in temperature from 20 to 140° C. caused a decrease in tensile strength of about 40 per cent in the case of dry yarn. At any given temperature and humidity the tensile value is practically a resultant of the two effects alone. Baking the yarn at 110° for eight days caused only a slight decrease in strength, but at 140° the rate of decrease was rapid. Solvent extraction of the yarn, removing the natural fats and waxes, caused an increase in tensile strength of some 30 per cent, while an addition of castor oil to this extracted yarn reduced its tensile strength considerably but not down to the value of the original yarn.

Better flaxseed production, T. E. Stoa (*North Dakota Sta. Circ. 23 (1924), pp. 8, figs. 8*).—The merits of good flaxseed, wilt-resistant varieties, and proper soil conditions are pointed out, together with a brief discussion of the production and consumption of flaxseed during recent years.

[Report of the Linen Industry Research Association, 1923], J. G. Crawford et al. (*Linen Indus. Research Assoc. [Lambeg, Co. Antrim], Rpt. Council, 1923, pp. 24, pls. 4*).—The activities of the association during the year ended September 30, 1923, are reported on as heretofore (E. S. R., 50, p. 135).

Washington oats, E. G. Schafer, E. F. Gaines, and O. E. Barbee (*Washington Sta. Bul. 179 (1923), pp. 3-29, figs. 11*).—The principal oats-producing areas in the State are delimited, and the characteristics and comparative yields of 29 oats varieties are shown, together with a discussion of fluctuations in the acreage and price of oats in comparison with other cereals.

The principal centers of oats production in Washington are the western part of Skagit and adjoining counties in the northwestern, and Spokane and Whitman counties in the Palouse country in the southeastern part of the State. A third locality of minor importance is in the southwest counties of Lewis and Clarke. Banner and Abundance have been outstanding during the past 10 years. Markton, a new variety immune to covered smut, promises to be more prolific than either Banner or Abundance. As a group the large white varieties are said to be superior to all others.

Ten per cent of the land devoted to cereals is planted to oats. The wheat acreage has steadily increased since 1903, while the acreage of oats and barley remained practically constant until 1920 and since then declined to about two-thirds of the acreage once sown to these crops. The price of oats during the prewar decade was higher per 100 lbs. than that of the other cereals, but from 1914 to 1921 wheat brought more money. In 1922, oats again sold for more than wheat on a weight basis. Although barley sells for less than either wheat or oats, its heavier yield gives it a higher acre value than the other cereals. Oats produce more pounds per acre than winter wheat at Pullman and have a higher acre value when sown under equally favorable conditions.

Soy beans, C. A. Zavitz (*Ontario Dept. Agr. Circ. 43* (*1924*), *pp. 4, fig. 1*).—Early Yellow with 21.3 bu., Tsurunoko 20.9 bu., and Minnesota No. 167 20.7 bu. have given the highest average acre yields of soy beans in seven years' tests at Ontario Agricultural College, while the best yields of green crops were made by O. A. C. No. 111, 7.7 tons, and Habaro and Ito San each 7.2 tons. O. A. C. No. 211 has been outstanding in late years. From 1919 to 1923, inclusive, soy beans and dent corn, grown in combination, averaged 13.2 tons of green crop, soy beans alone 7.8 tons, and corn alone 12.8 tons.

Sugar beet fertilization, O. B. Price (*Michigan Sta. Quart. Bul.*, *6* (*1924*), *No. 3*, *pp. 91–93*, *fig. 1*).—Fertilizer trials with sugar beets gave further evidence of the value of a complete fertilizer high in phosphoric acid for the more depleted types of soils. On heavier soils with more organic matter or where manure is applied nitrogen need not be used. In fields infested with root rot, beets in unfertilized plats were infected considerably more than fertilized plats, and greater infection was seen where the fertilizer was broadcasted than where drilled with the seed. In a study of rate and method of application of mixed fertilizer, 150 lbs. gave its best returns when used with the seed, 250 lbs. under the seed, and 500 lbs. applied half on each side of the row. The last treatment also made the highest yield in the test.

Sugar beet varietal series, E. E. Down (*Michigan Sta. Quart. Bul.*, *6* (*1924*), *No. 3*, *pp. 89–91*, *fig. 1*).—During three years Canadian beet seed averaged 9.1 tons of sugar beets per acre, American seed 9.1, Michigan seed 9, and foreign seed 8.6 tons, with respective sugar percentages of 14.24, 13.57, 13.58, and 14.09, and purity coefficients of 83.8, 81.96, 82.19, and 83.51.

The windrowing of sugar cane, W. H. Harrison (*Agr. Research Inst., Pusa, Sci. Rpts.*, *1922–23*, *pp. 25, 26*).—P. B. Sanyal observed that sugar cane stored under protection remained in excellent condition, whereas that stored in the open and exposed to climatic influence rapidly deteriorated. This work confirmed earlier conclusions (E. S. R., 48, p. 734) and demonstrated the possibility of storing cane in Bihar by windrowing, provided suitable precautions be taken.

A study of the nature of the enzyms inducing deterioration of windrowed canes and the mechanism through which their activities become effective was made in conjunction with the above investigation. These enzyms were found localized in certain portions of the cane, particularly in the nodes, and ordinarily not affecting the juice contained in the internodes. The effect of rain in contact with a somewhat dry windrowed cane is to bring about a translocation of these enzyms into the internodes, thus inducing deterioration.

Sweet clover in Kansas, L. E. Willoughby and E. B. Wells (*Kans. Agr. Col. Ext. Bul. 45* (*1924*), *pp. 16*, *figs. 9*).—Practical instructions designed for Kansas conditions deal with growing the crop for pasture, soil improvement, hay, and seed. Rotations including sweet clover are suggested for different sections of the State.

Steeping turnip seed in turpentine (*New Zeal. Jour. Agr., 28 (1924), No. 1, p. 34*).—Experiments at the New Zealand seed testing station showed that turnip seed suffered no diminution in germination after soaking for seven days at a temperature of from 65 to 70° F. in pure turpentine.

Hardiness studies with winter wheat, R. NEWTON (*West. Canad. Soc. Agron. Proc., 3 (1922), pp. 12, 13*).—The continuation at the University of Alberta of studies carried on earlier at the University of Minnesota (E. S. R., 50, p. 137) is reported briefly.

Modern wheats, R. H. BIFFEN (*Jour. Farmers' Club [London], 1924, pt. 1, pp. 2–9*).—The characteristics of varieties of wheat now in general cultivation in England are set forth, with a consideration of problems involved in the improvement of the crop.

A classification and detailed description of the more important wheats of Australia (*Aust. Inst. Sci. and Indus. Bul. 26 (1923), pp. 72, pls. 5*).—This is a revision and extension of Bulletin 18 (E. S. R., 44, p. 439) and deals with about 80 varieties of common and durum wheat.

On the longevity of seeds of Nelumbo nucifera, I. OHGA (*Bot. Mag. [Tokyo], 37 (1923), No. 439–444, pp. 87–95, figs. 7*).—Germination experiments by the author with seeds of *N. nucifera*, discovered in a layer of peat in south Manchuria, taken together with historical data and environmental observations indicate that the Nelumbo seed may possess a longevity of at least 120 years. In spite of the presence of many small pores in the seed coat, the seeds did not absorb water and germinate even after immersion for 8 months at 15–20° C. (59–68° F.), whereas, when filed before sowing, all germinated in a few days.

Results of seed tests for 1923, M. G. EASTMAN (*New Hampshire Sta. Bul. 211 (1923), pp. 16*).—The percentages of germination and purity are tabulated for 345 official samples of agricultural seed collected during the year ended June 30, 1923.

Work of the seed testing laboratory from 1918 to 1923, with notes on seed quality, seed testing, seed law compliance, and trade practices, M. T. MUNN and E. F. HOPKINS (*New York State Sta. Bul. 504 (1923), pp. 3–35*).—The average germination and purity of samples of agricultural seed tested during 1919 and until July 1, 1923, are tabulated, with an outline of the methods employed in testing seeds. Among other phases of the work discussed are the value of seed testing to the farmer, weed seeds, diseased seed, origin of seed, winterkilling of red clover from Italian-grown seed, and seed mixtures and objections to them. The results of official seed inspection under the new law (E. S. R., 44, p. 439) are reviewed briefly.

Weed value, E. G. CAMPBELL (*Jour. Amer. Soc. Agron., 16 (1924), No. 2, pp. 91–96, figs. 2*).—The possibility that deeply leached nitrates can, in part, be returned to the upper surface layers of the land by the growth and decay of certain species of weeds is pointed out. Early, late, and winter annuals appear to conserve nitrogen at times when no cultivated plants are present on the land.

HORTICULTURE.

A plan for the farm garden (*Illinois Sta. Circ. 278 (1924), pp. 8, figs. 3*).—In connection with planting plans and calendar, simple instructions are given for the construction and operating of hotbeds.

Analysis of materials sold as insecticides and fungicides during 1923, C. S. CATHCART, R. L. WILLIS, and L. R. SMITH (*New Jersey Stas. Bul. 392 (1923), pp. 5–18*).—Like that for the preceding year (E. S. R., 49, p. 233), this bulletin contains the results of analyses of various insecticidal and fungicidal materials sold in New Jersey in 1923.

Watermelons, H. P. Stuckey (*Georgia Sta. Bul. 143 (1924), pp. 109–131, figs. 4*).—This bulletin, consisting largely of general cultural information, includes the results of fertilizer tests at Brooklet and at the station. At Brooklet, where different nitrogen carriers were used in connection with constant amounts of phosphoric acid and potassium, the highest yields of watermelons were obtained from plats treated with nitrate of soda, the sulphate of ammonia plats being second and the nitrate of lime a close third. Efforts to associate quality of melons with fertilizer treatments were fruitless, the melons from a single plat being as variable as those from different treatments. Fertilizer tests at the station in 1914 failed to show any difference in the quality, texture, or flavor of watermelons due to the fertilizer treatments. The largest yield of good melons was produced on that area receiving a complete fertilizer.

Pruning fruit plants, R. J. Barnett (*Kansas Sta. Circ. 102 (1924), pp. 24, figs. 12*).—Beginning with a discussion of the general principles of pruning, specific directions are presented for pruning the apple, pear, peach, plum, cherry, grape, blackberry, raspberry, gooseberry, and currant.

Self-sterility and self-fertility of fruit varieties grown in New York, R. Wellington (*New York State Sta. Circ. 71 (1923), pp. 6*).—With the view of bringing to the fruit grower information concerning the importance of insuring proper pollination in his orchards by the selection of self-fertile or compatible varieties, the author discusses the sexual status of various fruit species, pointing out varieties which are self-fertile or self-sterile and suggesting varieties suitable as pollinizers for sterile or partly self-sterile forms. Original information is presented upon the results of cherry crosses carried on on the station grounds.

Cultivation and diseases of fruit trees in the Maltese Islands, J. Borg (*Malta: Govt., 1922, pp. VII+622*).—A general treatise on fruit growing in the Maltese Islands, presenting historical, cultural, varietal, and miscellaneous information.

Directions for spraying fruits in Illinois (*Illinois Sta. Circ. 277 (1924), pp 24, figs. 4*).—A revision of a previously noted circular (E. S. R., 49, p. 338).

Nitrogen-carrying fertilizers and the bearing habits of mature apple trees, F. C. Bradford (*Michigan Sta. Spec. Bul. 127 (1924), pp. 3–32, figs. 6*).—Opening the paper with the explanation of fruit bud development in the apple, the author presents and discusses growth and blossoming data obtained in three Michigan orchards, a Ben Davis, an Oldenburg, and a Wealthy, where nitrogenous fertilizers had been applied to certain trees since 1920. In two of the orchards, the Ben Davis and Oldenburg, the use of nitrogenous materials increased the number of new spurs, the number of fruit buds formed on those spurs, and the proportion of fruit buds to set fruit in 1923. Terminal blossoming and the number of fruit buds formed on old spurs were increased in the fertilized Ben Davis trees. Spur formation was more abundant in the shorter growths of the fertilized than the unfertilized Ben Davis trees. Younger branches on the fertilized Ben Davis and Oldenburg trees showed a strong tendency toward annual fruiting, while in the unfertilized trees the tendency was toward biennial bearing.

That fertilization was a restorative process was indicated in the fact that practically every shoot and older spur examined showed evidence of having made just as good growth, good spur formation, and frequent blossoming many years back before any fertilizer was applied as was manifested in the growth following the application of fertilizers. It is pointed out that fertilization can not be expected, on the one hand, to improve trees suffering from insufficient drainage or serious collar injury, nor, on the other, to benefit trees in a thoroughly vigorous condition. Fertilizers may be unnecessary at one stage of an orchard's existence and quite necessary later. It is emphasized that fertilizers do not directly affect fruitfulness, but by promoting vigorous growth may keep the trees in a condition capable of sustaining continued high production.

Spraying and dusting experiments with apples in 1923, P. J. PARROTT, F. C. STEWART and H. GLASGOW (*New York State Sta. Circ. 70 (1923), pp. 9*).—A presentation, as for the preceding year (E. S. R., 49, p. 39), of data obtained as a result of spraying and dusting investigations at North Rose, Hall, and Geneva. In all three places sprays were consistently more effective than dusts for controlling codling moth. Differences obtained in respect to scab control were not so definite, the more effective dust formulas being, at North Rose and Hall, quite as successful as were the sprays. At North Rose, with the exception of one dust (77-13-10 lime copper), red bug was as well controlled by dusts as by sprays. At Hall, spray gave more consistent control of aphids than was obtained with the dusts.

Physiological studies on apples in storage, J. R. MAGNESS and H. C. DIEHL (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 1, pp. 1-38, figs. 15*).—A report upon studies of the changes occurring in apples as they approach maturity on the tree and during the storage period subsequent to harvesting.

Measurements of apples at Arlington, Va., in the summer of 1919 indicated that size development may be greatly influenced by the distribution of rainfall. Measurements of the rate of softening on the tree of Delicious, Rome Beauty, Winesap, and Ben Davis apples showed a rapid softening with the approach of maturity in all but the Delicious. Determinations of the acidity in fruits while yet attached to the tree showed a decrease with the approach of maturity, but the authors suggest that the diminishing acidity may be associated with increasing size rather than with actual loss of acid.

Pointing out that the chemical changes in progress when fruit is harvested continue for the most part after picking, though at a modified rate, the authors report upon the relative rate of softening of Delicious, Rome Beauty, Ben Davis, Winesap, Rhode Island Greening, Yellow Newtown, and York Imperial apples held at 70 and 32° F. Although all varieties softened more rapidly at 70°, there was a distinct varietal response. Delicious and Rhode Island Greening softened very rapidly at the higher temperature, while Ben Davis, Yellow Newtown, York, and Winesap naturally long-keeping sorts, softened more slowly. Fruit designed for long keeping should be placed in cold storage as soon as possible after picking.

A test of the effect of the package on the rate of softening indicated that temperature alone is the controlling factor when fruit is held under conditions of normal respiration. There was a maximum loss of moisture in open containers and a minimum in closed barrels. Studies of the acidity changes in fruit stored at 32° showed a constant decrease in acidity in all varieties irrespective of the original acid content. The Delicious, with little acid, lost acidity about as rapidly as Rhode Island Greening, normally high in acid. Acidity apparently decreased relatively less rapidly during exposure to warm temperatures than softening increased.

Fruits thinly coated with paraffin showed very slight shrinkage even in open packages. Respiration studies with apples coated either with paraffin or with oil showed a higher CO_2 and a lower O_2 concentration in the gases contained in the intercellular spaces. The coating had no effect on acidity, but heavily coated fruits held at 32° soon developed a distinctly unpleasant flavor. Coatings retarded ripening, and unless applied very thinly injured the quality. Coatings either of paraffin or oil resulted in a reduced respiration rate in fruits held at 32, 64.5, and 80° F. At 32° the ratio of CO_2 to O_2 was less than 1, while at 80° the ratio was much greater than 1, indicating marked anaerobic respiration. In uncoated fruits the respiration ratio at all temperatures was approximately 1, indicating that there was no anaerobic respiration.

The rate of CO_2 evolution in normal Winesap apples averaged 1.97 mg. per kilogram hour at 32°, 16.45 mg. at 64.5°, and 23.73 mg. at 80°. Increases in the concentration of CO_2 in the atmosphere of the storage chamber markedly inhibited the softening rate of apples directly in proportion to the CO_2 present. At temperatures of 71.5° concentrations of from 5 to 10 per cent CO_2 had no appreciable effect on flavor, 20 per cent concentration gave a very slight fermentation taste, and 50 per cent rendered the fruit entirely inedible.

Earlier work (E. S. R., 50, p. 541) by the senior author and Burroughs is frequently cited.

Pollination of cherries [trans. title], R. Florin (*Meddel. Perm. Kom. Fruktodlingsförsök [Sweden], No. 1, (1924), pp. 34, figs. 10*).—This paper, with an English summary, presents a comprehensive review of cherry pollination studies in Europe and the United States. That part relating to Swedish investigations is reported for the first time. At Alnarp, in southern Sweden, it was found that most of the sweet and some of the sour cherries are practically self-sterile, the Morello variety being the only one found to be fully self-fertile. Various varietal combinations are suggested for securing satisfactory pollination. Other experiments conducted in the vicinity of Stockholm suggest other varietal combinations capable of producing satisfactory yields. Brief notes are made upon the synonymy of varieties.

An analysis of the peach variety question in Michigan, S. Johnston (*Michigan Sta. Spec. Bul. 126 (1924), pp. 48, figs. 11*).—In taking up the question of peach varieties for Michigan the author discusses various factors, climatic adaptation, orchard location, market and cannery demands, outside competition, etc., which are directly concerned in the success of peach growing in Michigan and incidentally in the choice of varieties.

Except in certain counties in southwestern Michigan where the climate is tempered by winds blowing off Lake Michigan, peach growing is hazardous and requires especial care in the selection of proper sites and soils. Contrary to popular belief, little if any difference was found in the blooming dates of important commercial varieties. A study of the Chicago market, the principal outlet for Michigan peaches, indicated the lack of high grade commercial varieties to precede and follow Elberta, the most important commercial variety at the present time. In addition it was found that Michigan peaches are handicapped by improper grading and packing. In respect to varieties, descriptive notes upon which are appended, the South Haven, a new yellow-fleshed, red-cheeked peach, ripening before Elberta, is considered of unusual promise.

The red and white currants: Their history, varieties, and classification, P. Thayer (*Ohio Sta. Bul. 371 (1923), pp. 309–394, pls. 14, figs. 8*).—This bulletin is presented in two parts, the first of which, entitled, A Review of Horticultural Literature, deals with the botany, history, and synonymy of varieties, and the second, entitled, Field Studies at Ohio Station, presents descriptive data obtained in an extensive varietal collection.

Methods of harvesting and irrigation in relation to moldy walnuts, L. D. Batchelor (*California Sta. Bul. 367 (1923), pp. 677–696, pl. 1*).—A study of the causes of discoloration of the kernels of Persian walnuts indicated that, although certain mold-forming fungi, principally *Alternaria* sp., are directly responsible for this injury, their presence is induced by adverse environmental and cultural factors. No mold was found on nuts encased in sound husks free from visible cracks and decay. Commercial and budded varieties were found freer from mold than seedling trees, a fact explained by the higher percentage in the latter of "stick-tights," or nuts which fail to shed their husks. Records taken on a group of 80 seedling trees showed a slight but insignificant correlation between the percentage of moldy nuts and individual trees. A comparison of side blighted and normal nuts indicated that the blight injuries in the husks were not a serious factor in mold entrance.

A study of the relation of stage of maturity to the presence of mold showed the lowest percentage of mold in nuts gathered when the husks were just beginning to crack. Nuts picked early in the season contained less moldy specimens than those gathered later, irrespective of husk condition. The maximum seasonal changes occurred in the green stick-tight group, the percentage of moldy nuts increasing from 6 per cent from September 23 to 28 to 50 per cent from October 10 to 14. The relation of husks to mold was also shown in records obtained on four crops from two groves, clean nuts showing 11 per cent mold and stick-tights 28 per cent. Nuts allowed to lie on the ground for several weeks showed a sharp increase in mold during the first two weeks followed by a period of no change.

Of the stick-tights the author distinguishes two classes, (1) the dried-up, black-husked group, which turned black on the tree, and (2) the green, stick-tight group, which increased rapidly in moldy individuals if allowed to lie on the ground. This latter group constituted the principal source of discolored kernels. Sunburned nuts dropping prematurely were also a likely source of moldy kernels. A comparison of rapid and slow curing methods indicated that no further development of mold takes place after gathering.

Two groups of nut trees, one of which was amply irrigated in late summer and the other from which water was withheld, yielded 22 and 52 per cent of stick-tights, respectively, suggesting that irrigation in the late fall is a desirable preventive measure.

The future of the oil palm industry in the French East African Colonies [trans. title], A. Rolet (*Rev. Gén. Sci., 35 (1924), No. 2, pp. 34–36*).—Beginning with the discussion of the present distribution of oil palms and the extent of production of palm oil, the author points out the great possibilities of exploitation under systematic management.

FORESTRY.

Loblolly pine in Maryland: A handbook for growers and users, J. A. Cope (*Baltimore: State Dept. Forestry, 1923, pp. VII+96, figs. 37*).—The loblolly pine (*Pinus taeda*), deemed of great importance in eastern Maryland as a source of lumber for the manufacturer of barrels, crates, and baskets and for fuel and many other purposes, is discussed in considerable detail as regards range, natural characteristics, enemies, uses of the wood, silvics, and economics. In addition, volume and converting tables and specimen selling contracts are appended. Yield tables based on 157 plats on the Eastern Shore of Maryland indicate that on good soil sites the loblolly pine, 160 trees per acre, is capable of producing at 60 years of age 44,300 bd. ft. of lumber. On account of the unusually thick bark the species is very fire resistant, especially the older trees.

Notes on maple sirup making: Effects of tapping on the trees and cost of making maple sirup, A. K. Chittenden (*Michigan Sta. Quart. Bul., 6 (1924), No. 3, pp. 121–123, fig. 1*).—Records taken on approximately 650 trees in the college sugar bush show an average annual production of 0.18 gal. of sirup per tree, with an average cost of manufacture over a period of four years of $2.33 per gallon. It is recommended that trees below 10 in. in diameter be not tapped. One bucket per tree is deemed enough except for large trees, when a maximum of two buckets was found to be profitable.

The relative cost of yarding small and large timber, D. Bruce (*California Sta. Bul. 371 (1923), pp. 3–36, figs. 4*).—Data obtained in three separate lumbering operations, two on the east side and one on the west side of the Sierra Mountains, showed that where machinery, rigging, and organization are equipped for handling large sizes of lumber, the cost per M. B. M. of yarding logs 18 in. in diameter at breast height was five to eight times that of logs 48 in in diameter. Detailed records are presented for each of the three studies showing the influence of the size of logs on the time required in the various operations. The results of the investigation are deemed of particular value in that the organization of yarding crews and their equipment were different for each of the three operations. In closing the author again points out, as in the closely related bulletin (E. S. R., 47, p. 540), that one of the reasons for the higher cost of handling small logs is that the net output of sawed lumber is less, although practically as much time is required to handle a small as a large log.

As a practical deduction, it is suggested that the present practice of close utilization of logs may not be as financially profitably as generally believed.

Recommended American lumber standards (*Washington, D. C.: Cent. Com. Lumber Standards, 1923, pp. [6]+7*).—This comprises material reported to the U. S. Department of Commerce by the Central Committee on Lumber Standards at Washington, D. C., on October 31, 1923.

Results of the examination of Nigerian timbers (*Bul. Imp. Inst. [London], 21 (1923), No. 3, pp. 444–461*).—Data obtained in an anatomical examination and mechanical and working tests of six species of Nigerian woods considered of possible value for export to the United Kingdom are presented.

Tree planting in East Griqualand, J. E. Kaufmann (*Union So. Africa Dept. Agr. Jour., 7 (1923), Nos. 2, pp. 145–155, figs. 5; 4, pp. 317–324, figs. 5; also in Union So. Africa, Forest Dept. Bul. 7 (1923), pp. 22, figs. 11*).—This article is of a general nature, dealing with the planting and care of forest trees and presenting notes on various species suitable for silvicultural purposes.

Iceland forestry, P. A. Ingvason (*Jour. Forestry, 22 (1924), No. 2, pp. 149–153*).—A brief article in which the author points out that, despite moderate thermal extremes, the forests of Iceland are scanty in size and in the number of constituent species. Only two trees, namely, *Betula odorata* and *Sorbus aucuparia*, reach full tree size. Many North American species are considered in respect to their possible adaptation to Iceland conditions.

Report of the director of forests for the year ended December 31, 1922, E. H. F. Swain (*Queensland Dept. Pub. Lands, Rpt. Dir. Forests, 1922, pp. 30*).—This is the administrative report for the year ended December 31, 1922 (E. S. R., 48, p. 541). Planting operations were the major activity of the department for the year, considerable knowledge being obtained concerning the silvicultural requirements of various important species.

Annual report on the forest administration in Ajmer-Merwara for the Year 1922–23, Dayanand Mamgain (*Ajmer-Merwara Forest Admin. Ann. Rpt. 1922–23, pp. 26*).—This is the usual annual report (E. S. R., 50, p. 40).

Report of the forest administration in the Bombay Presidency, including Sind, for the year 1922–23 (*Bombay Forest Admin. Rpt. 1922–23, pp. II+114+2, pl. 1*).—This is the usual administrative report (E. S. R., 50, p. 40), the greater part consisting of tabulated data concerning production of lumber, forest products, grazing, revenues, expenditures, etc.

Report on forest administration in Burma for 1922–23, F. A. Leete (*Burma Forest Admin. Rpt., 1922–23, pp. [8]+178, pls. 10*).—This report for the year ended March 31, 1923, contains the usual information (E. S. R., 50, p. 242) concerning changes in personnel, alterations in area, general protective activities, engineering and silvicultural operations, etc. Appended in tabular form are records pertaining to lumber and forest products, revenues, expenditures, etc.

DISEASES OF PLANTS.

Fungoid and insect pests of the farm, F. R. Petherbridge (*Cambridge, Eng.: Univ. Press, 1923, 2. ed., pp. VII+177, figs. 55*).—Recent research has necessitated the rewriting of this book, the first edition of which has been noted (E. S. R., 35, p. 835). The first 84 pages of the present edition deal with fungus diseases and the others chiefly with insects and nematodes.

Parasitic disorders of plants, M. Nicolle and J. Magrou (*Les Maladies Parasitaires des Plantes. Paris: Masson & Co., 1922, pp. 199*).—Treatment in systematic form is given to disorders of plants due to agents herein classified as animals, phanerogams, thallophytes, and bacteria, a final chapter giving a general view of matters related to parasitic diseases of plants.

Insects and plant diseases source of serious loss [in Wisconsin], C. P. Norgord (*Wis. Dept. Agr. Bul. 52 (1922), pp. 27–31, fig. 1*).—The most serious plant disease outbreak during the two years under report was that of tobacco wildfire, appearing on 90 farms in Dane County in June, 1922. The progress of control work with this disease, as well as with grain rust, white pine blister rust, and fire blight of apple is discussed.

[Report of] division of insect and plant disease control, S. B. Fracker (*Wis. Dept. Agr. Bul. 52 (1922), pp. 39, 40*).—Work with white pine blister rust, grain rust, potato-spraying demonstrations for the reduction of hopperburn losses, a large scale fire blight control area, organization of grasshopper control on a township basis, and the tobacco wildfire campaign are reported.

Botany and plant pathology [South Africa], I. B. P. Evans (*Union So. Africa Dept. Agr. Jour., 7 (1923), No. 6, pp. 550–552*).—A preliminary survey of the conditions under which deciduous fruits are exported was carried out during the year. This revealed very unfortunate and confused conditions at the Cape Town docks. Steps are outlined as taken to remedy the situation.

Sugar cane mosaic, as described from Java, Louisiana, and the West Indies, is widespread in Natal, a large proportion of the thick tropical varieties being severly damaged. Uba cane, here as elsewhere, was not affected. This cane forms nearly the whole crop of Natal and Zululand.

A peanut rosette is described as occurring in the Waterberg District and in the Pietersburg and Rustenberg Districts. Few or no nuts are produced. No organism has yet been found in this connection.

A number of other miscellaneous diseases are mentioned.

Annual report of the Government mycologist for 1921, W. Small (*Uganda Dept. Agr. Ann. Rpt., 1921, pp. 49–57*).—Coffee leaf and berry browneye spot (*Cercospora coffeicola*) has been more evident than formerly, affected berries running sometimes as high as 60 per cent. *Colletotrichum coffeanum* is thought to be merely a common saprophyte of weakened or dead twigs. *Hemileia vastatrix*, though present, causes little alarm. Hevea dieback (*Botryodiplodia theobromae*) has been noted, as has also the Oidium said to cause floury mildew in Java. *Ustulina zonata* and *Fomes lignosus* have also been found. Wheat black rust (*Puccinia graminis*) or orange rust (*P. triticinia*) can be found on all the wheat in the country, including three Indian wheats introduced a few years ago. Associated with orange rust is the leaf spot fungus *Leptosphaeria tritici*. A Helminthosporium, provisionally named *H. sorokinianum*, is common. *Ustilago tritici* has been found. *P. maydis* and *H. turcium* on maize leaves have not done much damage. It is thought that the aecidial stage of *P. maydis* may be here dispensed with. *Darluca filum* occurs in the sori of both *P. maydis* and *P. triticina*. Sorghum (matama) leaves are attacked by *H. turcicum*, *C. graminicolum*, and *P. purpurea*, but not yet severely. Sorghum head smut (*U. reiliana*) and grain smut (*Sphacelotheca sorghi*), though injurious, are controlled by weak formalin or copper sulphate. Sorghum downy mildew was found at Bukalasa. *Eleusine coracana* appears to be attacked by a blackening fungus at the lower internodes.

A wilt of cashew nut seedlings has been studied and found to be due to a species of Fusarium indistinguishable in culture from *F. udum*. The same Fusarium has been found in the form of hyphae in the root galls of Antirrhinums caused by the nematode *Heterodera radicicola* and again in the same garden causing carnation wilt or crown rot. This is thought to be the first record of a nematode attacking a plant in Uganda. *H. radicicola* has not been found on either tea or coffee, which are attacked in other countries. A symbiotic fungus (*Polysaccum crassipes*) has been found on Eucalyptus roots, and the wet root rot fungus has been found on roses, *Grevillea robusta*, *Melaleuca leucodendron*, and *Spondias lutea*. *Oidium* spp. have been found on mango and grape, that on the latter being *O. tuckeri*. The two rose leaf fungi (*Sphaerotheca pannosa* and *Diplocarpon rosae*) have been present as usual. *Albizzia moluccana*, grown as coffee shade, has been found to succumb to attacks of *B. theobromae* on the roots. *Fomes lucidus* has been found on an Albizzia dead from *Botryodiplodia* sp. The last-named fungus has been noted also as causing a die-back of pruned branches of *A. moluccana*. Fig leaves are severly attacked by *Uredo fici*, which occurs also on indigenous species of Ficus. The fruits also suffer a rot due to a Colletotrichum, the species of which has been found on dead shoots of the avocado pear.

A special report is made on an investigation into certain fungi occurring on rice in Uganda, in which it is concluded that there is only one major disease, blast (*Piricularia oryzae*), of rice in Uganda, though other fungi are discussed.

Experiments on chlorosis, with special reference to cases at Winscombe, Somerset, T. Wallace (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1922, pp. 84–92*).—Chlorosis of plants has been found to be associated with high contents of calcium and magnesium compounds in the soils. The chlorotic symptoms are increased by the addition of calcium carbonate to the potting soil. Chlorosis was not associated with a highly alkaline reaction of the soils, as shown by pH determinations. The addition of calcium carbonate or magnesium carbonate to soils not normally producing chlorosis may cause plants grown therein to become chlorotic. Plants become chlorotic more readily under summer than under autumn conditions.

The physiology of leaf scorch, F. Summers (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1922, pp. 75–83*).—In view of the number and variety of alleged or suspected causes of leaf scorch, an investigation was made as to the extent to which the physiological processes of the plant might be affected under scorching conditions.

It is stated that the characteristic browning of leaves suffering from scorch is an aftereffect which may make its appearance after the conditions causing the scorching have passed. The real primary effect is characterized by more or less complete destruction of the green pigments of the leaf combined with a drying out of the cells. The browning is probably due to the action of oxidizing enzyms upon the chromogens produced during the drying out of the leaves. This action does not take place in the dried leaf but commences as soon as moisture is reabsorbed from the air. Drying out of the leaf is caused by a sudden break in the transpiration stream arising in the leaf and not in the shoot. There is generally no intermediate wilting stage. While it has been shown that potash starvation may lead to scorching of the foliage, the relation of potash deficiency in the soil to the water conditions in the transpiring shoot needs further study. The fact that it has been proved that the photosynthetic process in the leaf is depressed when potash is withheld leads to the expectation that this relation will soon be established.

Toxicity studies with some copper fungicides, W. L. Doran (*Phytopathology, 13 (1923), No. 12, pp. 532–542; also New Hampshire Sta. Sci. Contrib. 21 (1923), pp. 532–542*).—Experiments are described in which comparisons were made of the susceptibility of several fungi to different forms of copper fungicides. The fungicides used were copper sulphate, neutral copper acetate, Burgundy mixture, Bordeaux mixture of various types, cuprammonium sulphate, and Johnson's mixture, which is composed of copper sulphate and undecomposed ammonium carbonate used in the ratio of 1:2. The fungi were tested by sowing spores in drops of water on a glass surface, the species used being *Gymnosporangium clavipes, Gymnoconia interstitialis, Uromyces caryophyllinus, Cronartium ribicola, Puccinia antirrhini, Alternaria solani,* and *Venturia inaequalis.*

It was found that the Uredinales were twice as resistant to the toxic action of copper as any of the other fungi, and the urediniospores of these fungi were three times as resistant as aeciospores.

As a result of the author's investigations it was thought that spraying with copper fungicides to prevent infection by urediniospores was probably impracticable, but the results obtained by Johnson's mixture seemed to indicate that it would succeed if any copper fungicide would. The conidia of *V. inaequalis* were found to be exceedingly susceptible to copper in any form. Bordeaux mixture in reduced strengths was not found to differ from the standard 4–4–50 formula in toxicity to the conidia of *V. inaequalis*, but the addition of sugar or molasses increased the toxicity. Aeciospores of *Gymnosporangium clavipes* were so resistant to Bordeaux mixture that spraying the conifer hosts for the prevention of Gymnosporangiums is thought to be of doubtful value. Burgundy mixture is said to have surpassed Bordeaux mixture in its toxicity to *A. solani*.

Colloidal copper hydroxid as a fungicide, H. D. Hooker, jr. (*Indus. and Engin. Chem., 15 (1923), No. 11, pp. 1177, 1178*).—"Preliminary experiments indicate that copper hydroxid prepared as a colloid is fungicidal to apple scab and apple blotch in concentrations of 1 part of hydroxid to 5,000 of water. At this concentration it produced very slight burning. It has excellent sticking properties due to its positive charge and spreads well in dilute soluton. It can be used in conjunction with lead arsenate and nicotin sulphate. Although it would be hazardous to estimate the cost of manufacture, it is clear that colloidal copper hydroxid would be much less expensive than either Bordeaux or lime sulphur."

Pests and diseases of the barley crop, A. Roebuck (*Jour. Inst. Brewing, 28 (1922), No. 6, pp. 451–455*).—This paper and the discussion which followed dealt with insects and other pests and with the barley diseases, covered smut (*Ustilago hordei*), loose smut (*U. nuda*), stripe disease (*Helminthosporium gramineum*), spot disease (*H. teres*), yellow rust (*Puccinia glumarum*), brown rust (*P. simplex*), and mildew (*Erysiphe graminis*).

Pests and diseases of barley and malt.—II, Fungi and the fungus diseases of barley, F. A. Mason (*Jour. Inst. Brewing, 28 (1922), No. 4, pp. 325-353*).—In an earlier communication (E. S. R., 46, p. 52) reference was made to the destruction of barley crops by insect pests. It is shown in the present paper that diseases probably cause much more loss. It is stated that before the introduction of methods for controlling plant diseases the loss to cereal production in Britain amounted to something like 40 per cent of the total barley crops. This percentage has been lowered, and at the time of this report was supposed to be between 5 and 10 per cent, though it is thought possible to reduce the damage to 1 or 2 per cent. Fungi and diseases of barley are herein discussed as regards the causative organisms, portions affected, effects, and control measures.

The diseases of wheat, E. M. Freeman (*Northwest. Miller, 135 (1923), No. 10, pp. 999, 1000, 1016-1020, figs. 8*).—The primary aim in giving this account is to present a picture of the diseases of wheat prevalent in the important wheat-producing areas of the world, including their several stages, overwintering, transmission, injury done, favoring or hindering factors, and protective measures.

Bunt of wheat, J. G. Brown (*Arizona Sta., Timely Hints for Farmers, No. 143 (1923), pp. 12, figs. 5*).—Wheat bunt, due to either *Tilletia tritici* or *T. levis*, though ordinarily caused in Arizona by the former fungus, inflicts annually a heavy loss, which is preventable by the use of clean seed and disinfectants. Preventive measures, including wet and dry seed treatments with copper sulphate, formaldehyde, hot water, and copper carbonate dust, are described in tabular form, together with the advantages and disadvantages of each.

The effect of rust infection upon the water requirement of wheat, F. Weiss (*Jour. Agr. Research [U. S.], 27 (1924), No. 2, pp. 107-118*).—Experiments are reported which were conducted to determine the effect of rust infection upon the water requirements of the wheat plant and the influence of different conditions of nutrition on the water relations. In these investigations Marquis wheat was grown to maturity in quartz sand cultures supplied with various combinations of mineral nutrients in solution. An artificial epidemic of leaf rust (*Puccinia triticina*) was induced in one series and of stem rust (*P. graminis tritici*) in another, while a third remained as a check. Rust infection of either type resulted in lowered water economy of the host, whether considered from the standpoint of the production of tops or of grain.

The addition of sodium chlorid or sodium phosphate to the basic 3-salt nutrient solution did not affect the susceptibility of wheat to leaf or stem rust. The addition of sodium nitrate resulted in somewhat readier infection in each case but did not predispose to greater injury. Potassium chlorid retarded infection in proportion to the diminution of growth of the host. Calcium chlorid and magnesium chlorid induced a state in which the host was less readily susceptible to infection. Calcium chlorid also reduced the water requirement of the plants by about 10 per cent for the tops and 40 per cent for the grain.

Barberry eradication reduces grain rust losses, W. A. Walker (*Wis. Dept. Agr. Bul. 52 (1922), pp. 66-70, figs. 3*).—Grain rust damage was light in 1922 owing to favorable weather conditions, except in fields near barberry bushes, crops in some such localities being completely destroyed. The farm to farm survey was completed for 26 counties in southern and western Wisconsin by September 30, 1922.

Alternaria from California, D. G. Milbraith (*Bot. Gaz., 74 (1922), No. 3, pp. 320–324, figs. 2*).—Frequent occurrence of a distinct spot, which is described, on the leaves of cabbage and cauliflower in certain sections of California led to an investigation of its causes and distribution. In culture media, infected leaf tissue taken from the spot yielded constantly a form of Alternaria which was found to be a species hitherto undescribed. A description of the fungus is given in connection with the name *A. oleracea* n. sp., which has been adopted.

Soy bean mosaic: Seed transmission and effect on yield, J. B. Kendrick and M. W. Gardner (*Jour. Agr. Research [U. S.], 27 (1924), No. 2, pp. 91–98*).—Additional data are given for 1923 supplementing an account of soy bean mosaic investigations previously reported (E. S. R., 46, p. 147). The disease does not appear to have become very prevalent in Indiana where the studies were made. Extensive inoculation experiments failed to show any other host than the soy bean for this disease. Varietal differences in regard to susceptibility were found, and generally from 10 to 25 per cent of the seed from mosaic plants produced mosaic seedlings. The disease was also found in 2-year-old seed saved from mosaic plants. Seed selected from mosaic-free plants gave rise to mosaic-free seedlings. The disease is not considered to lower the percentage of seed germination, but the yield of seed was reduced from 30 to 75 per cent.

The transmission of cane mosaic, C. E. Chardon and R. A. Veve (*Facts About Sugar, 15 (1922), No. 14, pp. 281, 283, 284*).—The present account, covering in part matter previously noted (E. S. R., 48, p. 246), deals more particularly with the rôle of *Aphis maidis* in spreading cane mosaic under field conditions in Porto Rico.

Citing results of field observations and experimental evidence, the authors state that *A. maidis* is found, with more or less abundance, on various grasses occurring locally in the sugar cane fields. After the weeding of the fields *A. maidis* passes to the eane plants, living in the central whorl of leaves for a period of time. During the short time that it stays on cane, *A. maidis* transmits the infective substance of the sugar cane mosaic from diseased to healthy plants and produces the disease.

The gumming disease of sugar cane, J. Matz (*Facts About Sugar, 15 (1922), No. 13, pp. 258, 259*).—In a paper read before the Association of Sugar Technologists of Porto Rico, June 4, 1922, the author discussed sugar cane gumming disease, its distribution and status in Porto Rico, also methods of its transmission and control.

This disease was noticed locally by the author during February, 1920. By the end of the harvest of that year it was located at several places indicated, and at the beginning of the 1921 harvest it was found to have spread over a much larger area. A year later it had spread west and into the interior and to several points south.

At first it was thought that gum diseased cane could be recognized only by the yellow gummy exudation from the cut ends of the cane, but it was found that the disease can be located in growing canes before they are cut by a peculiar appearance in the leaves which show pale green to almost pure white patches and streaks. These light colored areas are often sprinkled with small dark red spots or narrow streaks.

The disease is further described with recommendations for control, the chief dependence being placed in resistant varieties. It is recommended that Cavangerie and Caledonia should be propagated on a larger scale, for the present at least, as checks on account of their resistance to the disease.

Cane mottling eradication, R. A. Veve (*Facts About Sugar, 15* (*1922*), *No. 4, p. 78*).—The efficiency of the roguing method as applied to cane mosaic at Fajardo, P. R., is shown by the fact that the incidence of the disease was decreased from an average of 0.5 per cent in 1918–19 to an average of 0.002 per cent in 1921–22. It is thought that wherever the infestation is less than 15 per cent comparable results may be obtained.

Top rot of the sugar cane, H. Tryon (*Queensland Bur. Sugar Expt. Stas., Div. Path. Bul. 1* (*1923*), *pp. 56, pls. 9*).—This is an inquiry into the nature and origin of a disease affecting sugar cane in the Herbert River and other districts of Queensland. This investigation was carried out during the period from March 3 to April 4, 1903, at Victoria plantation, but it embraced also field observations at other localities of the same sugar cane producing district. The report, though not printed at that time, is thought to be of considerable importance at the present time in some of the northern districts.

The tentative conclusions reached, which were, in the main, sustained by a later inquiry, are to the effect that this disease, regionally known as cane rot, dry-rot, or Burdekin rot, has occurred in the cane fields of Queensland for a considerable time, that it is not peculiar to any cane variety, that it is not a constitutional disease, that it is primarily and essentially a root disease, that the injury is due to chemical change set up by a matter secreted by a parasitic fungus, that this is not an obligate parasite but that it has an independent saprophytic existence in the soil, that under normal conditions of healthy growth the plant is immune, and that the abnormal conditions under which the disease occurs are principally climatic.

The wildfire disease of tobacco in Wisconsin, G. H. Conant (*Wis. Dept. Agr. Bul. 52* (*1922*), *pp. 58–66, figs. 3*).—Tobacco wildfire (*Bacterium tabacum*), first identified in the United States after a severe outbreak in the Carolinas during 1917, appeared in Wisconsin in 1922. A closely related organism causing less injury has been known for several years under the name Wisconsin rust or bird's-eye spot. From this, however, wildfire is distinguished by its earlier appearance, its attacking the plants on the seed beds, and its very rapid extension. The present account details briefly the history of wildfire in Wisconsin and efforts for its control, including regulations to protect the 1923 crop, chief among which was that of picking and destroying all badly infected leaves, this work being done during the dry weather only. Where the work had not been carefully done, considerable spread resulted during wet weather. Extensive picking was done on 18 farms, and satisfactory results were obtained in each case. This method of control is regarded as important.

Fields of early, fast growing tobacco show a rapid spread of the disease soon after transplanting. Dry weather assists control measures.

Basisporium gallarum, a parasite of the tomato, G. B. Ramsey (*Bot. Gaz., 74* (*1922*), *No. 3, pp. 325–328, figs. 11*).—An unusual fungus is described which was isolated from California tomatoes in 1919, and which, it is thought, may become serious as a wound parasite. It was first isolated from a soft blister-like lesion near the blossom end of the ripe fruit. Numerous inoculation experiments have shown conclusively that the fungus is strongly pathogenic to the fruits of the tomato. All attempted inoculations upon unwounded surfaces of both ripe and green tomato fruits have failed. Inoculations in wounded surfaces of ripe fruits have always produced the characteristic decay described. Inoculation experiments with mature green tomatoes have proved positive, though the fungus grows more rapidly and produces rot more quickly in ripe fruits. The organism, although attacking a new host, is considered not specifically different from *B. gallarum*.

The influence of H-ion concentration on the growth of Fusarium lycopersici and on tomato wilt, I. T. Scott (*Missouri Sta. Research Bul. 64 (1924), pp. 3–32, figs. 10*).—A strain of *F. lycopersici* was grown in nutrient solutions, the H-ion concentrations of which were varied with the different cultures, and the dry weight of the mycelium was taken as an index of the growth made. Soil cultures in a greenhouse were also conducted with tomato plants, the seed for which had been inoculated with cultures of the organism. The H-ion concentration was varied in each series.

In the culture experiments, results indicate that in the culture media used a maximum of growth of the fungus was obtained at an average pH of from 4.5 to 5.3, followed by a minimum at an average pH of from 5.25 to 5.8, with a second maximum in most cases at an average pH of from 5.85 to 6.85.

In the greenhouse tomato plants were grown in pots of soil that were adjusted to various H-ion concentrations and artificially inoculated with a spore suspension. In the soil experiment a minimum of tomato wilt occurred at an H-ion concentration of from pH 6.4 to 7, there being a maximum of wilt on either side of this range.

The results of the soil infection experiment are believed to indicate that the Fusarium wilt of tomato might be controlled by selecting soils having a certain natural reaction or by properly adjusting the reaction of the soil so as to produce a reaction unfavorable for infection.

Overwintering of tomato mosaic, M. W. Gardner and J. B. Kendrick (*Bot. Gaz., 73 (1922), No. 6, pp. 469–485, pl. 1*).—A detailed account is given of the investigations which have been briefly reported (E. S. R., 50, p. 655).

Canker infection of apple trees through scab wounds, S. P. Wiltshire (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1922, pp. 71–73*).—In previous papers (E. S. R., 49, p. 48) various ways in which the canker fungus (*Nectria galligena*) enters the apple tree have been described. In continuation of this investigation the method by which canker follows scab infection on the stems has been worked out in some detail, and this method is herein briefly described. Whether spraying in autumn as soon as the fruit is off the trees would be useful or not has not been determined.

Canker control trials, S. P. Wiltshire (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1922, p. 74*).—A small spraying carried out with a 4–4–50 Bordeaux mixture November 9, 1921, on four of eight trees of the variety King of the Pippins, with the object of preventing the entrance of the fungus (*Nectria galligena*) by way of the fresh leaf scars, gives the impression that an autumn spraying against canker may not be so effective as to make it economically advisable.

Bark canker disease of apple trees, caused by Myxosporium corticolum, G. Gilchrist (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1922, pp. 67–70*).—A serious disease of apple branches observed at Long Ashton in 1920 was identified as bark canker, not previously reported in England, though said to have been known in the United States since 1910. The disease is described.

The results of experiments made locally support the view that the fungus (*M. corticolum*) is a weak parasite, dangerous only under exceptional conditions. Methods of infection are discussed.

Apple fire blight reduced in Dunn County campaign, E. L. Chambers (*Wis. Dept. Agr. Bul. 52 (1922), pp. 70–72*).—Promising results were secured in a two-year campaign to control fire blight on a rather large scale in Dunn County. Apple varieties were found to vary greatly as to susceptibility and resistance. The organism overwinters in cankers formed on the large branches and limbs of the more susceptible varieties and is scattered by insects attracted to the bacterial ooze issuing from these cankers during the blossoming period. The bacillus gains entrance through the nectaries or directly through injuries. The Transcendent crab apple is a prolific producer of virulent cankers and is the chief source of trouble in Wisconsin, though a few other varieties named are also troublesome. A fire blight clean-up campaign was undertaken during the spring of 1921 over an area of 36 square miles. Observations during the fall of 1922 showed fire blight to be greatly reduced in the smaller orchards of this area.

Factors influencing the development of internal browning of the Yellow Newtown apple, E. L. Overholser, A. J. Winkler, and H. E. Jacob (*California Sta. Bul. 370 (1923), pp. 3–40, pl. 1, figs. 3*).—A detailed account is given of investigations previously reported upon in part by the second author (E. S. R., 49, p. 545), and suggestions are offered for the control of internal browning. The recommendations include early harvesting, prompt storing at from 37 to 40° F., ventilation in storage, and wherever profitable the growing of other varieties of apples in place of the Yellow Newtown.

Spraying strawberries for the control of fruit rots, E. M. Stoddard, D. H. Rose, and N. E. Stevens (*U. S. Dept. Agr., Dept. Circ. 309 (1924), pp. 4*).—The results are given of a single-season's work which is thought to indicate that in the region where the investigations were carried on strawberry rots may be reduced by spraying. The application of Bordeaux mixture, and in some cases dusting, reduced the loss from rot which developed on the fruit after it was picked sufficiently to more than justify the expense of the treatment.

Statistical studies on the propagation of big bud and reversion disease of black currants, A. H. Lees (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1922, pp. 53–57*).—Tabular data are shown and discussed as obtained from a study of about 550 black currant bushes planted at Long Ashton in 1920 as regards big bud and reversion. Edina, supplied by a grower, showed a larger percentage of each trouble than did four other varieties (Boskoop, Seabrook, and Baldwin A and B) supplied by nursery firms.

The so-called smut of white fig varieties, E. H. Phillips and E. H. Smith (*Fruitman, 3 (1923), No. 3, pp. 4, 14, 15, figs. 3*).—Ten types of figs are described as indicating successive stages of ripening, the purpose of the season's work being to find out just when and in what manner infection with *Aspergillus* (*Sterigmatocystis*) *niger* took place. Previous experiments have shown that this occurred before the figs reached the packing house. The results are given in detail.

The spread of the chestnut blight in the southern Appalachians, G. F. Gravatt (*Jour. Amer. Leather Chem. Assoc., 19 (1924), No. 3, pp. 138–146, figs. 3*).—Chestnut blight (*Endothia parasitica*), first noted in America about 1904 (Bronx Park, New York City), has spread until it is now mapped as extending from Cape Cod to northeastern Ohio and from central New York to northwestern South Carolina. The rate of spread is estimated to be about 24 miles per year.

Trees attacked may live from 1 to 10 years, usually 3 or 4 years. Spot infections can be eradicated, but the advance of the main infection (80 per cent or more) is unchecked. Chestnut blight is claimed to be the most destructive tree disease known. The present chestnut stand appears to be doomed.

The maple wilt, R. H. Colley (*Wis. Dept. Agr. Bul. 52 (1922), pp. 76–78, figs. 2*).—A serious disease of the Norway maple caused by *Verticillium* sp. was discovered in Wisconsin during the summer of 1922. Comparatively little is known about the disease, which has supposedly been present for some years in certain widely distributed localities. The disease is spreading, silver, sugar, and sycamore maples also being attacked. The most pronounced symptoms of the disease is a sudden wilting of a branch or branches on what appears otherwise to be a perfectly healthy tree. The outlook for an easy method of control for this disease is not promising. The immediate removal of all infected trees is recommended.

White-pine blister rust (*Wis. Dept. Agr. Bul. 52 (1922), pp. 72–76, figs. 2*).—During the year a decided decrease in the number of new infection centers of blister rust was an outstanding feature. Although white-pine blister rust is strongly established in the northwestern part of Wisconsin and there is practically no hope of exterminating this fungus, it is thought that the present control measures are decidedly effective.

The destruction by the fungus Poria incrassata of coniferous timber in storage and when used in the construction of buildings, C. J. HUMPHREY (*Amer. Wood Preservers' Assoc. Proc., 19 (1923), pp. 188–207, figs. 16*).—During the previous 12 years the author had been accumulating information and material on the decay of timber used for building purposes, these investigations covering the entire United States and dealing with lumberyards and all types of buildings from the simplest structures to large industrial plants.

The decay due to *P. incrassata* is quite similar to that produced by the dry-rot fungus, *Merulius lacrymans*, and has probably been frequently confused with it, especially since the fungus is often found in a sterile condition. In common with *M. lacrymans*, infections first start in moist, cool situations, preferably on timber beneath floors which is either in contact with the ground or close to it. On the whole it appears to be of greater economic importance than any of the members of the Merulius group in the United States.

A description of the fungus is given. It grows most rapidly between 75 and 82° F. Below 75° it grows more slowly, but even at 55° it makes appreciable progress. It ceases growth around 95°. Nearly all kinds of wood are rotted by the fungus. Tabular showing is made of the time required to rot each of many commercial woods.

"In general, the tests indicate that we are here dealing with a fungus which is capable of attacking and destroying almost all of the commercial woods of the United States. The fact that commercial losses have so far been limited almost entirely to coniferous timber is purely a matter of circumstances, not of potentialities. Several instances are known, however, where the fungus has destroyed broadleaf woods in service, such as hardwood nail kegs, oak crating, and red-oak flooring."

The stem nematode Tylenchus dipsaci on wild hosts in the Northwest, G. H. GODFREY and M. B. MCKAY (*U. S. Dept. Agr. Bul. 1229 (1924), pp. 10, pls. 3, fig. 1*).—In previous publications (E. S. R., 50, p. 747 and 754) the occurrence of *T. dipsaci* on wild strawberries, alfalfa, etc., was reported. In the present bulletin the authors state that the nematode is rather abundant in the Pacific Northwest on the wild strawberry (*Fragaria chiloensis*) and on the false dandelion (*Hypochaeris radicata*). The wild strawberry strain of nematode occurs along the west coast of Oregon, and the false dandelion strain has been found from Puget Sound, Wash., to San Francisco, Calif. The two strains are believed to be entirely independent of each other. Several species of Fragaria are said to be capable of being infested, and the strawberry strain of nematode can be transmitted to red clover seedlings. All attempts to transmit the strain of the false dandelion to other hosts have failed.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The common garden mole in Iowa, E. E. Dunnam (*Iowa Sta. Circ. 88 (1924), pp. 4, figs. 5*).—This is a brief practical account.

Report of the division of ornithology, 1922, E. H. Forbush (*Mass. Dept. Agr., Dept. Pub. 126 (1923), pp. 23*).—This annual report of the ornithologist includes a brief comparison of the work of the downy woodpecker with that of the sapsucker.

A practical handbook of British birds, H. F. Witherby et al. (*London: Witherby & Co., 1920–1924, vol. 2, pp. XII+959, pls. 13, figs. 214*).—This second volume, which completes the work previously noted (E. S. R., 44, p. 158), deals with nonpasserine birds. It includes additions and corrections to the two volumes, a systematic list of British birds (pp. 903–936), and an index to volume 2.

The birds of Australia, VIII–X, G. M. Mathews (*London: H. F. & G. Witherby, 1919–20, vol. 8, pp. XIV+316, pls. 29; 1921–22, vol. 9, pp. XIV+518, pls. 54; 1922–23, vol. 10, pp. XI+451, pls. 37*).—These volumes, in continuation of the work previously noted (E. S. R., 44, p. 348), deal with the order Passeriformes. An index to the genera and species is included in each volume.

A new method of applying corrosive sublimate in destroying earthworms, E. J. Marshall (*Bul. Green Sect. U. S. Golf Assoc., 1 (1921), No. 10, p. 212*).—A method of applying corrosive sublimate by flooding a section of golf green is briefly described. A stock solution consisting of corrosive sublimate 8 oz., ammonium chlorid 8 oz., and water 1 gal., is prepared, 1 pt. of which will contain the 1 oz. of corrosive sublimate to add to each barrel of water. It can also be applied easily and effectively in dry form.

The pathogenicity of insect flagellates to vertebrates, with special reference to Herpetomonas ctenocephali Fantham, H. E. Shortt (*Indian Jour. Med. Research, 10 (1923), No. 4, pp. 908–933, pl. 1*).—The author's investigations have led to the conclusion that the question of infection of vertebrates by natural insect flagellates requires further study by modern cultural methods before it can be accepted as a definite fact. The strains of *H. ctenocephali* and *H. luciliae* Strickl., used in the present series of experiments, proved noninfective to vertebrates in over 50 experiments. A list is given of 31 references to the literature.

Studies on the blood of insects, I, II, R. A. Muttkowski (*Bul. Brooklyn Ent. Soc., 18 (1923), No. 4, pp. 127–136; 19 (1924), No. 1, pp. 4–19, figs. 12*).—The first part of this contribution from the University of Idaho deals with the composition and the second part with the structural elements of the blood of insects. Bibliographies accompany both parts.

Social life among the insects, I–VI, W. M. Wheeler (*Sci. Mo., 14 (1922), No. 6, pp. 497–524, figs. 17; 15 (1922), Nos. 1, pp. 68–88, figs. 12; 2, pp. 119–131, figs. 4; 3, pp. 235–256, figs. 12; 4, pp. 320–337, figs. 9; 5, pp. 385–404, figs. 11; 6, pp. 527–541, figs. 12; 16 (1923), Nos. 1, pp. 5–33, figs. 15; 2, pp. 160–177, figs. 11; 3, pp. 312–328, figs. 10*).—The material here presented has been noted as a whole from another source (E. S. R., 50, p. 253).

Catalogue of Indian insects, I–III, T. B. Fletcher and R. Senior-White (*Calcutta: Govt., 1921, pt. 1, pp. IV+40; 1923, pts. 2, pp. II+124; 3, pp. 31*).—Part 1 of this work, by Fletcher, deals with the Acrydidae (Tettigidae), and parts 2 and 3, by Senior-White, with the Culicidae and Bombyliidae, respectively.

The insects of 1922, E. N. Cory (*Md. Agr. Soc. Rpt., 7 (1922), pp. 240–263*).—This is a paper that was presented at the annual meeting of the Maryland State Horticultural Society held at Frederick in January, 1923. It is pointed out that the increase in the European red mite (*Paratetranychus pilosus*) was the most important development in the crop pest situation in the State in 1922. New uses for paradichlorobenzene are briefly considered, the rosy aphid situation is discussed, and a spraying program for peaches is considered.

[Economic insects and their control in Oregon] (*Oreg. Bd. Hort. Bien. Rpt. 17 (1921–22), pp. 41–46, 56, 96–104, 122–151, 166–170, 183–195, 199–205, figs. 44*).—The papers here presented include the following which relate to pests of economic importance or control measures: Orchard Spray Program for Oregon, by A. L. Lovett and H. P. Barss (pp. 96–104); Vegetable Insects (pp. 102–104) and Insect Pests of Truck and Garden Crops (pp. 122–141), both by A. L. Lovett; The Peach Borer: How to Prevent or Lessen Its Ravages, the Paradichlorobenzene Treatment, by A. L. Quaintance (pp. 142–151); The Cherry Fruit Fly (pp. 166–168) and The Logan Berry Crown Borer (pp. 169, 170), both by A. L. Lovett; The Asparagus Beetles and Their Control, by F. H. Chittenden (pp. 183–190); The Grape Phylloxera, by J. M. Aldrich (pp. 191, 192); How the Presence of Phylloxera is Indicated, by W. M. Davidson and R. L. Nougaret (pp. 193–195); and The European Earwig in Oregon, by B. B. Fulton (pp. 199–205).

The principal insect pests of tobacco in Jamaica, C. C. GOWDEY (*Jamaica Dept. Agr., Ent. Circ. 9 (1923), pp. 6*).—This is a brief account of the principal tobacco pests occurring in Jamaica, namely, the horn worm (*Protoparce sexta jamaicensis* (Kirby), *Celerio lineata lineata* (Fab.), cutworms, the budworm (*Chloridea obsoleta* Hubn.), cigarette beetle, tobacco flea beetle, and grasshoppers.

New developments in the control of truck crop insects, C. C. HAMILTON (*Md. Agr. Soc. Rpt., 7 (1922), pp. 346–352*).—This is a paper presented before the Maryland Vegetable Growers' Association in January, 1923. Work in which the homemade and commercial brands of nicotin dust were used in combating the pea aphid are briefly considered. The work is said to have given encouraging results.

Contributions on forest entomology [trans. title], I. TRÄGÅRDH (*Meddel. Statens Skogsförsöksanst., No. 20 (1923), pp. 401–424, figs. 18*).—Accounts are given of the spruce resin fly (*Chilosia morio* Zett.?), the larva of which is not predatory but takes its nourishment from the sap of the spruce tree; the one-banded pine weevil (*Pissodes phiniphilus* Herbst), which attacks chiefly the crown of pine trees; *Orchestes testaceus* Müll., the larva of which mines in the leaves of birch and alder; *Trichogramma evanescens* Westw., an egg parasite of *Lyda* (*Cephaleia*) *signata* F.; and several other parasites of *L. signata.*

The use of aluminum sulphate in place of copper sulphate in insecticide-fungicide combinations, A. KELSALL (*Acadian Ent. Soc. Proc., No. 8, (1922), pp. 8–17*).—The author finds that, under conditions existing in Nova Scotia, where the experiments were conducted, mixtures of aluminum sulphate and lime have some fungicidal action against apple scab, though much feebler than that of Bordeaux mixture, but the same mixtures were found to have very little, if any, fungicidal action against late potato blight. Aluminum sulphate had some fungicidal action against smut of oats, but not as much as that possessed by copper sulphate.

"White arsenic, the cheapest of all arsenicals, was satisfactorily used as an insecticide on foliage against biting insects when in combination with aluminum sulphate lime mixtures. Aluminum sulphate lime mixtures were fairly successful as repellents against the potato flea beetle, but not quite as effective as Bordeaux mixture."

Five years' spraying and dusting experiments, W. H. Brittain (*Fruit Growers' Assoc. Nova Scotia Ann. Rpt. 59 (1923), pp. 53–70*).—This is an address presented before the Nova Scotia Fruit Growers' Association.

Onion thrips (Thrips tabaci): Improved methods of control, R. H. Pettit (*Michigan Sta. Quart. Bul. 6 (1924), No. 3, pp. 107–109, figs. 2*).—It is pointed out that the treatment or control measure now in general use consists of a spray or dust of nicotin used at the rate of 1 or 0.75 pint of nicotin (40 per cent) to 100 gal. of water, with the addition of 4 lbs. of laundry soap. It is recommended that two applications be made six or seven days apart.

Spraying and dusting for the control of pear psylla, F. Z. Hartzell (*New York State Sta. Circ. 72 (1924), pp. 14*).—This account, presented at the annual meeting of the New York State Horticultural Society at Rochester, N. Y., in January, 1924, is preliminary to a bulletin in the course of preparation which will present detailed information. It is pointed out that an application of lime sulphur (1:8) at the time the embryos are developed to such an extent that the eggshells are transparent will destroy them. An application for both first and second brood nymphs should be made after practically all the eggs have hatched, while the nymphs are still soft shelled. Nicotin dust containing at least 2 per cent actual nicotin has been found effective for the control of adults and hard-shell nymphs, providing the trees were properly enveloped with a sufficient amount of material when the temperature was above 60° F., the humidity moderate, the foliage dry, and the air currents just sufficient to prevent the dust from spreading in all directions. The use of dust is recommended as giving practical control of psylla in commercial orchards which are too large to be treated by a one-spray rig. Factors affecting the efficiency of insecticides and methods of estimating dosage are considered, and a table for determining the tree volume and number of pounds of dusts required is included.

Mordvilko's keys for the determination of aphids living continuously or temporarily on graminaceous plants and sedges (*Bul. Ent. Research, 13 (1922), No. 1, pp. 25–39*).—The keys of A. K. Mordvilko[1] have been translated and condensed.

A taxonomic, ecologic, and economic study of Ohio Aphididae, T. L. Guyton (*Ohio Jour. Sci., 24 (1924), No. 1, pp. 1–30*).—This work includes keys to the subfamilies and a list of Ohio species of plant lice.

On the taxonomy, biology, and distribution of the biting lice of the family Gyropidae, H. E. Ewing (*U. S. Natl. Mus. Proc., 63 (1924), Art. 20, pp. 42, pl. 1, figs. 18*).—This account includes descriptions of 3 new subfamilies, 7 new genera, and 12 new species. A host list is given.

The European corn borer, Pyrausta nubilalis Hbn., v. the corn earworm, Heliothis obsoleta Fab., G. W. Barber (*Jour. Agr. Research [U. S.], 27 (1924), No. 1, pp. 65–70, pl. 1*).—Investigations by the author of the infestation of flint field corn by the bollworm and the European corn borer at Arlington, Mass., in the fall of 1921, details of which are presented in tabular form, show that the two pests may exist in harmony in the same host plants.

"In each of two examinations made [October 14 and 31] 100 per cent of the ears were found infested by one or the other species. Both species were present in 71 per cent of the ears in the first case and in 82 per cent in the second case. The European corn borer infested 88 per cent of the ears in the first instance and 96 per cent in the second. Larvae of the corn earworm were found in 83 per cent of the ears in the first count and in 86 per cent in the second count.

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[1] Izv. Petrograd. Oblastn. Sta. Zashch. Rast. ot Vred., 3 (1921), No. 3, pp. 72.

"Injury resulting from the feeding of larvae of these two species was found on October 14, 1921, to be a destruction of 10.5 per cent of the total grain on 100 ears and on October 20, 1921, 18.9 per cent of the total grain on 50 ears. This injury was to fully developed kernels and not to any that had failed to develop because of injury by the European corn borer to other parts of the plants. It was found that on the last-mentioned date the corn earworm was responsible for 60 per cent of the total damage, or 11.18 per cent of actual grain destruction, while 40 per cent of the total damage, or 7.72 per cent of actual grain destruction, was inflicted by the European corn borer. These figures show the total injury caused by the corn earworm, but do not show the whole damage by the European corn borer, such as undeveloped kernels and feeding by the latter species after the corn earworm has become full grown and deserted the ears.

"Since it has been shown that these two species may exist in corn, each feeding independently of the other and each contributing a share to the total injury, it appears that, should the European corn borer ever reach the great corn-producing area in which severe losses occur through feeding of corn earworm larvae, the total damage resulting from the injury by both species would probably lead to an appreciable decrease in the yield of grain."

The ingestion of methylene blue by Stomoxys calcitrans [trans. title], V. NITZULESCU (*Compt. Rend. Soc. Biol. [Paris], 90 (1924), No. 2, pp. 155, 156*).—The author calls attention to the fact that in the course of observations of the frequence of the stable fly in various sections of Jassy, Rumania, he has found it to make up 30 per cent of the flies occurring in pharmacies, while the percentage occurring elsewhere, except in stables, is much smaller. This is thought to be explained by a chemotaxis produced by the subtle odors of pharmacies. The observations show that large numbers of stable flies have been killed by sweetened water to which Fowler's solution has been added. Three house flies and two stable flies that were inclosed in a cage with two large watch glasses containing cane sirup colored with a concentrated solution of methylene blue succumbed the following day. Dissection demonstrated the presence of methylene blue in all of the flies.

Tsetse in the Transvaal and surrounding territories: An historical review, C. FULLER (*Union So. Africa, Dept. Agr., Ent. Mem. 1 (1923), pp. 68, pls. 9, figs. 10*).—The several parts of this work, following the introduction, deal with the subject as follows: The first period, 1836–1838 (pp. 9–15), the second period, 1846–1849 (p. 15–20); the third period 1868–1873 (pp. 21–29); fourth period, 1888–1897 (pp. 29, 30); tsetse east of the Transvaal (pp. 31, 32); tsetse in Zululand (pp. 32, 33); the tsetses of South Africa (pp. 33, 34); conclusion (pp. 34–39); and synopsis (pp. 39–41). Appendixes are given on Tsetse in the Zoutpansberg District, by H. J. Grobler (pp. 42, 43); Tsetse in the Eastern Low Country, by J. E. D. Travers (pp. 43–46); Notes on the Rustenburg District, by W. Behrens (pp. 47, 48); Tsetse in Zululand, by C. Saunders (pp. 49, 50); The Fly Belts of Zululand (pp. 50–53); notes and extracts from correspondence (pp. 53–60); and Tsetse in the Letaba-Singwedsi Basin, Northeast Transvaal, by B. H. Dickl (pp. 60–63). A list is given of 22 references to the literature cited.

The effect of temperature upon the full-eyed race of Drosophila, R. K. HERSH (*Jour. Expt. Zool., 39 (1924), No. 1, pp. 43–53, figs. 4*).—"Temperature causes a decrease in facet number in the full-eyed race between the experimental temperature of 15 to 31° C. It can not be determined from the data whether the decrease is of an exponential or linear order. The fact that the effect is greatest at the lower temperatures and least at the higher temperatures seems to indicate that it may be of an exponential order. The temperature effect in full is not as marked as the temperature effects on the bar stocks. In full the effect is approximately a 2.5 per cent exponential decrease, while in bar it is 9.1 per cent and in ultrabar it is 9.9 per cent. The critical temperature for a change in facet number is at 27°, as in all of the bar stocks. The ratio of the facet counts in females and males is 0.984."

The North American species of parasitic two-winged flies belonging to the genus Phorocera and allied genera, J. M. Aldrich and R. T. Webber (*U. S. Natl. Mus. Proc. (1924), Art. 17, pp. 90, fig. 1*).—In this synopsis the authors recognize 81 species, of which 41 are described as new.

Some observations on the bionomics of Xenopsylla astia Rothsch., F. W. Cragg and C. S. Swaminath (*Indian Jour. Med. Research, 10 (1923), No. 4, pp. 979–989*).—This is a report of observations of a species commonly and widely distributed in India.

The Japanese beetle in relation to golf grounds, B. R. Leach (*Bul. Green Sect. U. S. Golf Assoc., 1 (1921), No. 10, pp. 210, 211*).—A brief discussion of work with the Japanese beetle in golf courses in the infested area.

The Japanese beetle: Its life history and control in golf greens, B. R. Leach and J. P. Johnson (*Bul. Green Sect. U. S. Golf Assoc., 3 (1923), No. 10, pp. 262–268, figs. 7*).—This is a contribution from the laboratory of the U. S. D. A. Bureau of Entomology at Riverton, N. J.

The Argus tortoise beetle, F. H. Chittenden (*Jour. Agr. Research [U. S.], 27 (1924), No. 1, pp. 43–52, pl. 1, figs. 4*).—This is an account of *Chelymorpha cassidea* Fab., which attacks the foliage of sweet potato every year, but has not as yet become of economic importance. Other Convolvulaceae, including bindweed and wild morning-glory, are attacked by the adults and larvae. Studies by the author in the District of Columbia show the eggs to be deposited in clusters varying from 16 to 28 on the lower surfaces of the leaves. They hatch in about 10 days into light yellow larvae, which are gregarious and feed on the lower side of the foliage. In about 3 weeks the larvae become mature and develop into pupae, which in from 7 to 9 days transform to adults. The species is evidently single-brooded in the North, double-brooded southward, and in the District of Columbia there is an exceptionally small second generation. Should the pest become sufficiently abundant to be destructive it may be hand picked in all stages, and the adults and larvae may be killed with arsenicals. A list is given of 15 references to the literature.

Insecticidal effect of cold storage on bean weevils, A. O. Larson and P. Simmons (*Jour. Agr. Research [U. S.], 27 (1924), No. 2, pp. 99–105*).—In this paper the authors report upon experiments with *Bruchus obtectus* Say in California pink beans (*Phaseolus vulgaris*) and with *B. quadrimaculatus* Fab. in black-eye cowpeas or beans (*Vigna sinensis*). The results, the details of which are presented in tabular form, show that exposure of larvae, pupae, and adults of *B. obtectus* to 32° F. for 56 days or to 36° for 66 days gave very satisfactory control. Considerably shorter periods of exposure were found to render the surviving adults incapable of reproduction. In work with *B. quadrimaculatus* a temperature of 39° for 32 days was insufficient to kill all stages, but all stages were killed when subjected to 32° or colder for 32 days. The eggs were killed by four days' refrigeration at 32 or 20°, but a longer time was necessary to kill them at 39°. They were more susceptible to cold than the other stages.

High temperatures as a remedy for Lyctus powder-post beetles, T. E. Snyder (*Jour. Forestry, 21 (1923), No. 8, pp. 810–814*).—The author reports upon tests made of the effect of high temperature in kiln-drying treatments of hardwood lumber infested with powder-post beetles. The investigations show that it is necessary to run the infested material through the ordinary process and at the end of this operation to raise the temperature to 180° F., or over for a period of one-half hour or longer, depending upon the dimensions of the sapwood.

A contribution to the knowledge of the morphology and biology of Otiorhynchus ovatus L. [trans. title], P. SPESSIVTSEFF (*Meddel. Statens Skogsförsökanst., No. 20 (1923), pp. 241–260, figs. 10*).—This is a report of studies of *O. ovatus* made during an outbreak in the district forest nursery at Kungsbacka, in the south of Sweden, in 1922 and 1923, where it attacked the roots of 3-year-old pine.

Methods of boll weevil control, R. P. BLEDSOE (*Georgia Sta. Circ. 78 (1924), pp. 5a–12a*).—A brief account of the life history and habits of the boll weevil is followed by a discussion of varieties, fertilizers, cultural methods, and direct methods of control. The author concludes that for the coming season it is probably safest for farmers to cut their acreage until they can cultivate, fertilize, and poison according to the methods outlined.

"Poison with a molasses mixture before the squares form, unless spring infestation is very light. Follow this with calcium arsenate dust when infestation reaches 10 to 15 per cent. Molasses spray may be used in place of the dust, but the evidence at present is that the dust is best. The Florida plan appears promising, but more work is necessary with this method before it can be recommended for Georgia conditions."

Some injurious Neotropical weevils (Curculionidae), G. A. K. MARSHALL (*Bul. Ent. Research, 13 (1922), No. 1, pp. 59–74, pls. 2, figs. 4*).—Six forms from Porto Rico, one of which represents the new genus Apodrosus, are described as new, namely, *A. wolcotti*, from Rio Piedras; *Diaprepes capsicalis*, observed feeding on the leaves of pepper at Rio Piedras; *Lachnopus coffeae* from Rio Piedras and *L. coffeae montanus* from Yauco, both of which feed on the young leaves of coffee; *Lechriops psidii*, which feeds on the fruits of the guava at Mayaguez; and *Ampeloglypter cissi*, which feeds on the tender shoots of *Cissus ampelopsis*. *Cholus wattsi* n. sp. was found to be injurious to pineapples in Grenada, *Conotrachelus psidii* n. sp. to attack the fruits of the guava at Bahia, Brazil, and *Piazurus papayanus* to bore in the leaf stems of the papaya at Bahia.

Growth and feeding of honeybee larvae (*U. S. Dept. Agr. Bul. 1222 (1924), pp. 38, figs. 13*).—The data here given are presented in two parts:

I. *The date of growth of the honeybee larva*, J. A. Nelson and A. P. Sturtevant (pp. 1–24).—The authors' investigations of the rate of growth are charted and discussed, with the details given in tabular form. A list of 11 references to the literature cited is included.

II. *The feeding of honeybee larvae*, B. Lineburg (pp. 25–37).—The details of this study are presented in connection with charts and tabular data. The attention given eggs and larvae of the honeybee by the nurse bees is said to consist in visits to the cells for the purpose of inspection and for work or nursing carried on within the cell, the number of such visits amounting to over 10,000 and averaging about 1,300 per day during the eight days from the time the egg is laid till the fully grown larva is sealed within the cell.

"The elaborated food on which larvae feed during about the first two days of the larval period is practically all placed in the cell with the newly hatched larva soon after hatching. This is mass feeding. Soon after the second day another kind of food is supplied to the worker larva. This food contains considerable undigested pollen and is fed at approximately the same rate at which it is consumed by the larva. The fact that the method of feeding the worker larva is changed, for no apparent reason, after the second day, together with the excessive amount of time spent in visits of nurse bees to the older worker larvae, suggests that there may be here a reciprocal feeding between the nurse bees and the older worker larvae, as has been observed in related insects, such as ants and wasps."

The differentiation of sex in the bee, I–VII, C. S. R. FERGUSSON (*Bee World, 4 (1922), No. 7, pp. 146, 147; 4 (1923), Nos. 8, pp. 160, 161; 9, pp. 174, 175; 10, pp. 190, 191; 11, pp. 206, 207; 12, pp. 222, 223; 5 (1923), No. 1, pp. 1–3*).—An account based upon a review of the literature and studies conducted by the author.

British Hymenoptera, A. S. HUCKHURST, L. N. STANILAND, and E .B. WATSON (*London: Edward Arnold & Co., 1923, pp. 48, pls. 8, figs. 16*).—This work, with an introduction by H. M. Lefroy, includes brief, semipopular accounts of the families of Hymenoptera occurring in Great Britain.

The life history and habits of European Apidae, H. FRIESE (*Die Europäischen Bienen (Apidae). Das Leben und Wirken unserer Blumenwespen. Berlin and Leipzig: W. de Gruyter & Co., 1922–1923, pts. 1–5, pp. VII+456, pls. 33, figs. 100*).—This is a general account of the life history and bionomics of European bees, with 33 plates in colors.

Results of experiments with miscellaneous substances against the chicken mite, W. M. DAVIDSON (*U. S. Dept. Agr. Bul. 1228 (1924), pp. 11*).—This is a report of tests made by the U. S. D. A. Insecticide and Fungicide Board at its Vienna, Va., laboratory, as to the effect of a number of insecticides upon *Dermanyssus gallinae* Redi. Of the miscellaneous treatments tested only two were of any value. A medicated roost remained free from mites, while naphthalene burned in sawdust and carbon was efficient when used in a fumigatorium. Sulphur burned at the rate of 6 lbs. to 1,000 cu. ft. was inefficient, and it is apparent that the fumigation of chicken houses is not satisfactory. Numerous materials used in the form of dust were found to be of no value. Powdered derris root and pyrethrum flowers were efficient when undiluted. Naphthalene was efficient only in the case of nest boxes and not in chicken houses. Tests of materials applied as paints indicated that heavy oils, either pure or slightly diluted with lighter oils, were efficient, and cresol, 5 and 10 per cent, in whitewash was of some value.

As a result of the tests of sprays the author recommends the use of heavy oils from coal tar and wood tar, or such oils diluted with a lighter oil, such as kerosene, so that not less than 20 per cent of the mixture is heavy oil. The use of such materials will successfully control chicken mites provided the premises are thoroughly sprayed. A heavy mineral oil emulsion containing at least 20 per cent oil in the actual spray will be efficient under similar conditions.

FOODS—HUMAN NUTRITION.

The encyclopedia of food, compiled by A. WARD (*New York: Artemas Ward, 1923, pp. X+596, pls. 79, figs. 330*).—This is an extensive compendium of information on foods both rare and common. An interesting feature is a dictionary in six languages of food terms. The volume is abundantly illustrated with photographs and colored plates.

The digestibility of raw starches and carbohydrates, C. F. LANGWORTHY and A. T. MERRILL (*U. S. Dept. Agr. Bul. 1213 (1924), pp. 16*).—Continuing earlier work of this character with men (E. S. R., 47, p. 763), digestion experiments with women as subjects were made.

It was shown that pure raw starch from corn, wheat, and rice flours was completely digested. Experiments on raw potato starch gave coefficients of digestibility varying from 100 to 49 per cent, the average value being 81 per cent. Experiments with raw patent flour and raw farina, wheat products containing practically no bran, in all cases gave a coefficient of digestibility of 100 per cent for the starch.

The average digestibility of the carbohydrate in raw graham flour was 97 per cent. The lower coefficient as compared with that of the patent flour is doubtless due to the high bran content of graham flour. The carbohydrate in raw corn meal was in round numbers 99 per cent digested.

The average coefficients of digestibility of the raw starches as determined in these experiments with women were practically the same as those determined in previous experiments with men as subjects.

The carbohydrate characteristic of the endosperm of raw waxy maize, a substance reacting red with iodin, gave a coefficient of digestibility of, in round numbers, 97 per cent and is apparently as digestible as the starch in raw corn meal.

An interesting point in connection with several of the tests is that high coefficients of digestibility were obtained in spite of the fact that the subjects experienced general nervousness at the beginning of the experiments and were subject to occasional headache or other slight bodily discomfort at times during the experiment.

Digestibility of baked goods made from patent flour, H. J. Deuel (*Jour. Home Econ., 15 (1923), No. 12, pp. 699–701*).—The experiments on the thoroughness of digestion of pie crust here reported formed part of an extended series with grain and grain products carried on in the home economics work of the U. S. Department of Agriculture. Included in the report are the results of a series of experiments with baked goods made from patent flour which formed a part of cooperative experiments carried on by the Department some time ago in cooperation with the Minnesota Experiment Station, and hitherto unpublished. The following table summarizes the results:

Digestibility of baked goods made from patent flour.

Kind of baked goods.	Number of experiments.	Coefficients of digestibility.		Kind of baked goods.	Number of experiments.	Coefficients of digestibility.	
		Protein.	Carbohydrate.			Protein.	Carbohydrate.
		Per ct.	*Per ct.*			*Per ct.*	*Per ct.*
Rolls	3	88.6	97.7	Ginger snaps [1]	3	85.2	97.7
Yeast biscuit	3	88.2	96.8	Doughnuts	3	91.8	96.8
Currant buns	3	88.0	98.1	Pretzels [1]	3	88.2	98.0
Sea biscuit	3	94.1	98.8	Pancakes	3	86.3	96.5
Baking-powder biscuit	3	88.2	97.4	Soda crackers	3	92.7	98.4
Sugar cakes	3	88.4	98.0	Boston butter crackers	3	93.0	96.7
Ginger cakes	8	85.6	97.8	Boston crackers	9	87.7	97.9
Molasses cakes	3	84.6	97.9	Pie crust	5	76.9	99.5

[1] Bread included in diet.

"Wheat flour seems to be thoroughly digested, whether eaten as a constituent of rolls, baking-powder biscuits, doughnuts, pancakes, cookies, bread, or various other kinds of baked goods, and no digestive disturbance was reported by any of the subjects during the experiments."

Yeast bread compared with baking-powder bread in nutritive value, L. V. Gault (*Jour. Home Econ., 15 (1923), No. 12, pp. 689–696, figs. 7*).—Yeast-raised whole-wheat bread was compared with whole-wheat bread made with baking powder, using rats as subjects. Similar rats were also fed a mixed diet for purposes of control. An experiment was also made in which patent flour was substituted for whole-wheat and spring-wheat flour and the amount of yeast ranged from one-half cake to six cakes per loaf. The method of making the bread and details of the diets are given.

In describing the results obtained, the author states that the fact that "the yeast bread made from whole-wheat flour nourished albino rats more effectively than whole-wheat bread made with baking powder is undoubtedly due to the increase of the water-soluble vitamin from a low to a more adequate level, and also due to the protein of the bread being supplemented to a great extent. Bread containing six cakes of yeast to a loaf is very palatable and nourished the rats much more effectively than bread made with one-half cake to the loaf. The extra yeast supplemented both the water-soluble vitamin and the protein. Yeast is therefore a nutrient constitutent of bread, and any increase in the amount up to quantities far in excess of those ordinarily used will improve the food value of the product."

In discussing experiments with white bread made with the different amounts of yeast the author states that "the addition of the larger amounts of yeast undoubtedly increased the water-soluble vitamin content besides supplementing the protein of the flour and milk. The fact that the rats did not make the maximum gain when six cakes of yeast were used indicates that a greater amount of yeast could have been used to advantage in further improving the bread protein, as well as the stimulating action of yeast on protein metabolism which may be associated with the larger vitamin content of yeast."

Amino acids in nutrition, VI, VII, B. SURE (*Jour. Metabolic Research, 3 (1923), No. 3, pp. 373–391, figs. 8*).—Continuing the series of studies previously noted (E. S. R., 47, p. 660), two papers are presented.

VI. *The nature of the supplementary value of protein-free milk to the total proteins of milk* (pp. 373–382).—The purpose of this study was to determine (1) whether lactalbumin has any supplementary value to casein when the total proteins of milk are introduced at a 10 per cent level and (2) whether protein-free milk may serve as a supplement to the total proteins of milk at a level of 10 per cent.

Five lots of from 4 to 5 young rats each were used. The animals in the first lot, receiving purified casein at a 10 per cent level as the only protein, showed a fair rate of growth. In the second lot, receiving 2 per cent lactalbumin and 8 per cent casein, there was good growth in one case, but failure of growth in the other four. On supplementing this diet by 28 per cent of protein-free milk in place of 4 per cent of the salt mixture and 24 per cent of dextrin there was improvement in growth, and on replacing the 28 per cent protein-free milk by 0.4 per cent of cystin growth was equal if not superior. The further addition of 0.4 per cent tyrosin appeared to increase the growth still further.

It is concluded that protein-free milk has a distinct supplementary value to the total proteins of milk at a 10 per cent plane of protein intake, due either to cystin or to some organic sulphur compound which can readily be transformed into cystin.

VII. *Further studies on the cause of the nutritive inadequacy of the proteins of the Georgia velvet bean (Stizolobium deeringianum)* (pp. 383–391).—The experiments reported in this paper supplement and confirm an earlier study in which it was shown that cystin is a growth-limiting factor in the proteins of the Georgia velvet bean (E. S. R., 47, p. 365), and also confirm the conclusions of Finks and Johns that indigestibility is also a growth-limiting factor with this bean (E. S. R., 47, p. 461).

In the present work the velvet bean pod meal was used as the source of protein. When fed raw at a 40 per cent level, introducing 8 per cent of total protein, rapid decline in weight followed, but when the meal was autoclaved fairly good maintenance but no growth resulted. The addition of 9 per cent of casein caused excellent growth and partial success in reproduction, while the further addition of cystin to the extent of 0.4 per cent of the total ration in place of an equivalent amount of dextrin caused a further improvement in the extent of rearing the young during the second lactation period.

The utilization of atmospheric nitrogen by Saccharomyces cerevisiae, E. I. FULMER (*Science, 57* (*1923*), *No. 1483, pp. 645, 646*).—The author reports briefly that he has succeeded in obtaining continuous growth of yeast in a medium consisting only of cane sugar and dipotassium phosphate in the proportion of 10 gm. of the former and 0.45 gm. of the latter in 100 cc., and that in this simple medium growth continues in the absence of all except atmospheric sources of nitrogen. It is suggested that the benefits accruing from the aeration of yeast cultures may be due quite as much to the addition of nitrogen as of oxygen.

Acid-base metabolism, I, II, A. T. SHOHL and A. SATO (*Jour. Biol. Chem., 58* (*1923*), *No. 1, pp. 235–266*).—Two papers are presented.

I. *Determination of base balance* (pp. 235–255).—The term base balance is understood to mean the difference between mineral acid radicals (except carbonates) and basic radicals (except ammonia) expressed in cubic centimeters of N/10 solution. In the calculations the phosphate radical is assigned a valence of 1.8— "the extent to which it is neutralized in the blood." The base balance is positive when the base is retained or the acid is excreted in excess of intake.

The data reported include metabolism determinations conducted on two babies, (1) on a normal diet and (2) on the same diet with the addition in one case of 250 cc. or N/10 HCl and in the other of 473 cc. of N/10 $NaHCO_3$. The results obtained are summarized as follows:

"In babies under one year the normal positive base balance is 10 cc.±2 cc. of N/10 per kilogram per day. Acid or alkali when added also affect the character of the salt retention. Acid causes a smaller salt retention than normal, and alkali causes a salt retention approximately normal in amount but more alkaline in substance. Acid or alkali when added are retained to about one-seventh or one-eighth. The excretion of added acid is by way of the kidney; of added alkali, partly by the kidney and partly by the bowel. Two hundred fifty cc. of N/10 HCl lower the positive base balance from 12 to 9.5 cc. of N/10 per kilogram; 473 cc. of N/10 $NaHCO_3$ raise it from 8 to 23 cc. of N/10 per kilogram."

II. *Mineral metabolism* (pp. 257–266).—In this paper data are presented on the total ash, nitrogen, calcium, magnesium, sodium, potassium, phosphorus, sulphur, and chlorin balances in the above study, with the following results:

"In the urine, HCl increases the excretion of ash, nitrogen, calcium, sodium, phosphorus, and chlorin. Potassium, magnesium, and sulphur are not affected. In the feces, HCl increases the excretion of ash, nitrogen, calcium, magnesium, and chlorin. Sodium and potassium are not affected. It decreases the phosphorus. In retention, HCl decreases ash, nitrogen, calcium, magnesium, sodium, potassium, phosphorus, sulphur, and chlorin.

"In the urine, $NaHCO_3$ increases the excretion of ash, nitrogen, sodium, potassium, sulphur, and chlorin. It decreases calcium, magnesium, and phosphorus. In the feces, $NaHCO_3$ increases the excretion of ash, nitrogen, calcium, sodium, potassium, phosphorus, sulphur, and chlorin. It decreases magnesium. In retention, $NaHCO_3$ increases the magnesium and sodium. It decreases the ash, nitrogen, calcium, potassium, phosphorus, sulphur, and chlorin."

Metabolism of 1-pyrrolidone carboxylic acid and its stability to acids and alkalis, R. M. Bethke and H. Steenbock (*Jour. Biol. Chem., 58 (1923), No. 1, pp. 105–115*).—In connection with the question of the possibility of prolin being a limiting factor in the growth processes of animals when not present in the proteins of the food, attempts were made to determine to what extent pyrrolidone carboxylic acid, which is readily formed from glutamic acid, is metabolized in the animal body. The results of the metabolism experiments, which were conducted on two male pigs, are summarized as follows:

"Pyrrolidone carboxylic acid can be metabolized by the animal organism. When ingested in large amounts, it is partly excreted unchanged in the urine. When incompletely metabolized no increase in amino nitrogen of the urine results, showing that hydrolysis does not proceed so rapidly as to lead to the production of amounts of glutamic acid in excess of the animal's ability to deaminize it completely. The acidity or alkalinity of the digestive tract is not sufficient to account for the hydrolysis of the pyrrolidone carboxylic acid. Its cleavage as well as its deamination must therefore be a function of body tissue."

Studies of urinary acidity.—II, The increased acidity produced by eating prunes and cranberries, N. R. Blatherwick and M. L. Long (*Jour. Biol. Chem., 57 (1923), No. 3, pp. 815–818*).—In this continuation of the studies of urinary acidity (E. S. R., 48, p. 163), a study was made of the change in composition of the urine resulting from the ingestion of large quantities of prunes and in one case of cranberries. The basal diet of the two subjects consisted of whole milk 1,200 cc., graham crackers 300 gm., and raw apple 150 gm. One of the subjects ate in addition one egg and 200 cc. of cream daily. After several days on this diet the prunes were added to the extent of 300 gm. daily and in one case 450 gm. In the experiment with cranberries 305 gm. were eaten. In addition to the determinations made in the previous study, the urines were analyzed for hippuric acid.

The changes in the urine following the prune period were an increase in the H-ion concentration and in the titratable acidity, no significant changes in the phosphorus excretion, marked increases in the ammonia output, and decreases in the total nitrogen, and very large increase in the values for organic acids and for hippuric acid. An analysis of prunes and cranberries for benzoic acid gave values too low to be considered as the sole precursor of the hippuric acid found in the urine.

Copper as a constituent in woman's and cow's milk.—Its absorption and excretion by the infant, A. F. Hess, G. C. Supplee, and B. Bellis (*Jour. Biol. Chem., 57 (1923), No. 3, pp. 725–729*).—Determinations by the ethyl xanthate method of Supplee and Bellis[1] are reported of the copper content of commercially pasteurized milk, human milk, and the urine of infants and adults. The method was first tested for reliability by analyses of aqueous solutions of copper and of milk containing known amounts of copper, and found to be reliable for as small amounts as 0.005 mg. of copper in 100 cc.

A sample of raw cow's milk contained 0.55 mg. per liter; three samples of commercially pasteurized milk 0.6, 0.7, and 0.6 mg., respectively; and two samples of human milk 0.4 and 0.61 mg. per liter. The urine of one infant fed cow's milk alone contained 0.06 mg., that of four others on cow's milk and cereal 0.066, 0.04, 0.06, and 0.08 mg., respectively; that of two on human milk and cereal 0.06 mg. each; and of five children from 2 to 3 years of age on a general diet 0.14, 0.04, 0.65, 0.08, and 0.10 mg. per liter, respectively. The urines of two adults, one on a diet low, and the other high in copper, were found to contain at the end of two 3-day periods 0.09 and 0.08 mg. and 0.14 and 0.11 mg. per liter, respectively.

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[1] Jour. Dairy Sci., 5 (1922), No. 5, pp. 455–467.

The authors are inclined to the view that copper exerts some physiological action in the body. "Whatever may prove to be its physiological or pathological significance, our investigations show that cow's milk and woman's milk regularly contain copper, and, furthermore, that in infants and adults copper is absorbed from the alimentary tract as proved by its constant presence in the urine."

Some temperature studies on Bacillus acidophilus milk, N. Kopeloff and P. Beerman (*Soc. Expt. Biol. and Med. Proc., 20 (1923), No. 6, pp. 303, 304*).—It is reported that daily determinations of the number of *B. acidophilus* in milk held in the ice box at 9° C. showed a destruction of 50 per cent in 1 day, 75 per cent in 2 days, and 90 per cent after 3 days. Since the therapeutic value of *B. acidophilus* milk depends chiefly on the concentration of organisms in the milk, it is considered preferable to keep the milk at room temperature instead of in the ice box. Further studies of the effect of various temperatures indicated that milk to be used for inoculation with *B. acidophilus* should be sterilized in the autoclave at 20 lbs. pressure for 20 minutes or at 15 lbs. for from 20 to 30 minutes, and that *B. acidophilus* milk can be completely sterilized in 1 liter portions in the Arnold steam sterilizer for 10 minutes with a final temperature of 81°.

The inhibition of putrefactive spore-bearing anaerobes by Bacterium acidophilus, J. C. Torrey and M. C. Kahn (*Jour. Infect. Diseases, 33 (1923), No. 6, pp. 482–497*).—A study in vitro of the mode of action of *B. acidophilus* in suppressing the growth and activity of the proteolytic organisms native to the intestinal tract is reported, the data of which indicate that the principal factor concerned is the increased acidity produced by this organism.

The method employed consisted essentially in observing the course of proteolysis of solidified egg albumin cubes and the resulting H-ion concentration in test tubes containing *B. sporogenes* in association with *B. acidophilus* or *B. coli* in the presence of graded amounts of glucose or lactose.

It was found that, irrespective of the type of acid-producing organism grown in association with *B. sporogenes*, visible proteolysis started at about pH 5.8 and became rapid between pH 6 and 6.4, while if sufficient sugar was present to permit the maintenance of an acidity of pH 5.6 or higher the egg cubes did not undergo proteolysis.

Aqueous extracts of pancreas, II, III (*Jour. Biol. Chem., 58 (1923), No. 1, pp. 321–346*).—The two papers noted below supplement preliminary reports which have not been noted.

II. *Physical and chemical behavior of insulin,* H. A. Piper, R. S. Allen, and J. R. Murlin (pp. 321–336).—In this paper the method employed by the authors for obtaining an active extract of insulin is outlined, and the properties of the product are discussed.

Insulin is considered to be of nonprotein nature, but to exist in the living pancreas in such a combination with protein as to require special means of separation. It is soluble in acidulated water or alcohol and is precipitated from such solutions at a range of pH 4.3 to 5.7. Heating to 80° C. for one-half hour does not destroy it, and it withstands dialysis in thin vegetable parchment for many hours. It is capable of being adsorbed by various adsorbents, which is thought to account for the difficulty of separating insulin from protein.

The possibility that insulin is a sort of activated glutathione concentrated by some selective action of the islet cells is discussed and disproved. It is considered probable that insulin, acting with some hormone in the liver, transforms glucose of the ordinary variety into the form in which it probably occurs in the blood. "The mechanism of oxidation is already present in the tissues (glutathione); it requires a special product (insulin) with immediate access to the portal system to catch glucose as it enters the circulation and in cooperation with the liver to transform it into an oxidizable form."

III. *Some precipitation reactions of insulin*, C. P. Kimball and J. R. Murlin (pp. 337-346).—Various reagents have been used to precipitate insulin from aqueous solutions with the following results: No precipitate—formaldehyde, ethyl acetate, benzene, toluene, carbon tetrachlorid, ferric chlorid, copper sulphate, magnesium sulphate, and chloroform(?); interfering circumstance—pyrogallol, picric acid, phenylhydrazin, copper acetate, basic lead acetate, and petroleum ether (?); positive—ammonium sulphate, sodium chlorid, trichloroacetic acid, acetone, and various alcohols; and negative—cadmium chlorid, phosphotungstic acid, sodium sulphate, zinc sulphate, phosphomolybdic acid, uranium acetate, sodium acetate, mercuric chlorid, potassium mercuric iodid, bromin, and ether(?).

Glucokinin.—III, An apparent synthesis in the normal animal of a hypoglycemia-producing principle. Animal passage of the principle, J. B. Collip (*Jour. Biol. Chem., 58 (1923), No. 1, pp. 163-208, figs. 5*).—In continuation of the studies on glucokinin (E. S. R., 50, p. 765), the author has demonstrated profound hypoglycemia to occur in normal rabbits as follows: When injected with certain plant extracts, following extreme overdosage of insulin, following injection with guanidin sulphate, spontaneous occurrence, and after prolonged fasting. It has also been found that the active hypoglycemia-producing substance is capable of animal passage to an indefinite extent, with resulting symptoms on injection of the blood of extreme weakness or convulsions, which may be relieved for a time, but not ultimately, by the administration of glucose.

The hypoglycemia-producing substance has been found to be active after autoclaving at 15 lbs. pressure. It can be dialyzed and concentrated by boiling aqueous solutions over a free flame. It is present in the filtrate obtained after treating passage blood with tungstic acid and can be removed from passage blood by ammonium sulphate.

Oxidation of glucose by iodin in the presence of insulin, G. A. Alles and H. M. Winegarden (*Jour. Biol. Chem., 58 (1923), No. 1, pp. 225-234*).—To determine whether insulin alone or in the presence of certain animal fluids has any influence upon glucose in vitro, determinations were made of the oxidation to gluconic acid ($C_6H_{12}O_7$) by iodin of pure glucose and of glucose solutions previously treated with aqueous insulin extract alone or mixed with liver extract, blood serum, or oxalated blood. A study was first made of the rate of oxidation of glucose, mannose, fructose, and sucrose by iodin in solutions of $NaHCO_3$ and Na_2HPO_4.

As shown by others, the rate of oxidation of the various sugars by iodin varies with the nature of the sugar. The addition of insulin or insulin and body fluids had no effect upon the rate of oxidation of the glucose by iodin. "This shows that no appreciable reaction takes place between glucose and insulin even in the presence of the animal fluids mentioned. It indicates, therefore, that the metabolic process must be more complicated in character, also that there is little promise of developing a method of assay for insulin on the basis of its action on glucose in glass."

Hypoglycemia, J. B. Collip (*Minn. Med., 7 (1924), No. 1, pp. 9–11*).—This is a general discussion of various observations on the production of hypoglycemia in normal and diabetic animals by injection of insulin and of the similar but not identical substance obtained from plant extracts.

The after effects of prolonged fasting on the basal metabolic rate, M. M. Kunde (*Jour. Metabolic Research, 3 (1923), No. 3, pp. 399–449, pls. 3*).—This extensive investigation was conducted on two human subjects, a man and a woman who fasted for 15 days, and on three dogs which fasted for 37, 40, and 41 days, respectively. The lengths of the after periods were 9½ weeks for the man, 6 months for the woman, and 9½, 4½ and 3½ months for the three dogs. During the control periods no attempt was made to regulate the quantity and kind of food eaten by the human subjects, and both continued their usual occupations while fasting. The dogs were fed during the control period on an accurately weighed maintenance diet. While the publication should be consulted in the original for the various data obtained, points of general interest may be summarized as follows:

Daily variations appeared in the basal metabolic rate of both man and dog, but there was no appreciable lowering of the basal metabolic rate during the fasting period. Immediately following the prolonged fasting there was a temporary increase in the basal metabolic rate proportional to the duration of the fasting and a loss in body weight. In all subjects there was a rapid gain in weight following the fasting period. The dogs maintained normal weight on a lower calorie intake after the fasting than before, indicating a more economical use of the food.

The basal metabolic rate of female dogs during rut was normal or slightly lower than normal. There were indications of seasonal variations in the basal metabolic rate of the human subjects. During the first 4 days of menstruation the basal metabolic rate was slightly subnormal.

An experiment with malnourished children, G. G. Mudge and H. F. Rich (*Nation's Health, 4 (1922), No. 8, pp. 509, 510, figs. 2*).—Whole milk and sweetened condensed milk as a part of a diet were studied, using two groups of 16 children each. In the group given the diet containing whole milk, the average age was 8 years and the average weight 9.75 lbs. below normal. In the group given the diet containing sweetened condensed milk, the average age was 7 years, and the average weight 7.75 lbs. below normal. The test covered 12 weeks.

According to the authors' conclusions the total gain in weight of the group fed whole milk was 28.37 lbs., and the group fed on rations containing sweetened condensed milk 34.62 lbs. The average gain in weight per child in their respective groups was 1.77 and 2.16 lbs., an excess of 6.25 lbs. for the gain of the sweetened condensed milk group, or 0.39 lb. per child more than for the whole milk group.

"The resulting figures of this preliminary experiment may be taken to indicate that sweetened condensed milk has a par value with fluid milk (pasteurized) in the treatment of malnourished children of school age. Similar experiments now under way tend to verify the results herein reported."

Fat metabolism and A vitamin [trans. title], R. Hamburger and J. A. Collazo (*Klin. Wchnschr., 2 (1923), No. 37–38, p. 1756*).—A brief report is given of a study of the blood fat of normal and of rachitic children in the fasting state and following the feeding of a considerable amount of butter, in one case with no other addition and in the other with the addition of 10 gm. of cod liver oil.

Normal fasting values are given as from 0.19 to 0.26 per cent. For the rachitic children the fasting values without and with cod liver oil were 0.25 and 0.206 per cent, respectively. Following the feeding of a large amount of butter the blood fat of the rachitic child receiving no cod liver oil doubled in amount in 6½ hours, while that of the one receiving cod liver oil rose to only 0.281 per cent. Similar differences were noted in normal children. It is concluded that cod liver oil has a regulatory influence on fat metabolism in the sense of favoring fat resorption probably as a result of increased oxidation. Light treatment is considered to act the same way.

Fat-soluble vitamins, XIV, XV (*Jour. Biol. Chem., 58 (1923), No. 1, pp. 59–103, figs. 9*).—Continuing the series of studies on fat-soluble vitamins (E. S. R., 50, p. 363), two papers are presented.

XIV. *The inorganic phosphorus and calcium of the blood used as criteria in the demonstration of the existence of a specific antirachitic vitamin*, H. Steenbock, E. B. Hart, J. H. Jones, and A. Black (pp. 59–70).—The experiments reported in this paper furnish additional evidence that the antirachitic fat-soluble vitamin is not identical with the antiophthalmic, and that it is essential for growth as well as for the prevention of rickets. Evidence is also presented that the restoration of the normal composition of the blood of animals suffering from rickets may be used as a criterion of the presence of antirachitic vitamin as distinguished from vitamin A.

The experiments were conducted first on dogs and later on White Leghorn chickens. In describing the diets used for dogs, emphasis is placed on the importance, as pointed out by Hess et al. (see p. 71), of raising the animals from birth on a uniform diet and placing them on the experimental diet as early as possible to avoid any irregularity of results. With this in mind, the parent bitch was fed a cooked grain mash of equal parts of ground white corn and rolled oats, with whole milk ad libitum. The puppies when 4 weeks old were placed on the standard rickets-producing diet consisting of the same mash autoclaved for 1 hour at 15 lbs. pressure and fed ad libitum, 200 cc. of centrifuged milk also autoclaved for 1 hour, 5 gm. of precipitated calcium phosphate, 2 gm. of sodium chlorid, and 5 gm. of casein. Distilled water was allowed ad libitum. On this diet the puppies invariably showed signs of rickets after 39 days. After 56 and 80 days on the experimental ration blood samples were taken and analyzed for calcium by the De Waard method (E. S. R., 45, p. 316) and for inorganic phosphate by the Bell-Doisy-Briggs method (E. S. R., 48, p. 111). At the end of 80 days one of the five dogs had died, and the blood of the others showed a marked reduction in phosphorus and in three cases a slight reduction in calcium. Three animals were then given daily 1, 4, and 12 cc., respectively, of cod liver oil aerated as described in the previous paper of the series. One was kept as a control.

Blood analyses 24 days later showed in the treated animals a slight increase in calcium and a marked increase in inorganic phosphate, amounting to 35, 81, and 96 per cent, respectively. Analyses of the femurs of the animals at the end of the experiment gave values of 37.81 and 34.38 per cent of ash for the two controls, 41.84 per cent for the dog which had received 1 cc. of aerated cod liver oil with a further supplement later of 5 gm. of butterfat, and 43.08 and 40.46 per cent for the two receiving 4 and 12 cc. of aerated cod liver oil. The butterfat had been added to the diet in the case mentioned because the animals were not growing normally even after the addition of the aerated cod liver oil, thus suggesting that the vitamin A content of the food had been too low.

The second experiment was conducted on 12 White Leghorn chickens which had grown to weights of from 359 to 655 gm. on the standard ration used for the university flock. The experimental ration, which invariably produced leg weakness or rickets accompanied by a decrease in the inorganic phosphorus of the blood, consisted of white corn 97, calcium carbonate 2, and sodium chlorid 1 part, with skim (centrifuged) milk ad libitum. Three chickens were killed for blood and bone analysis at the beginning of the experiment and 3 more 4 weeks later. The other 6 were given cod liver oil in daily doses of 1 cc. of untreated oil in 1 case, 1 cc. of aerated oil in 2, 3 cc. of aerated oil in 2, and 5 cc. of aerated oil in 1 case.

The aerated oil increased the content of both phosphorus and calcium, doubling the latter in 13 weeks. With the restoration of the blood to normal there was also restoration of growth (evidence that the antirachitic vitamin is necessary for growth) and recovery from leg weakness. As in the case of the dogs, there was an increase in the total ash content of the bones following the administration of the cod liver oil.

XV. *Calcium and phosphorus relations to growth and composition of the blood and bone with varying vitamin intake*, R. M. Bethke, H. Steenbock, and M. T. Nelson (pp. 71–103).—The first determinations consisted of analyses of the bones of rats fed a synthetic ration of purified casein 18, salts 4, dried yeast 2, agar 2, and dextrin 74 per cent, to which had been added various amounts of skim or whole milk The animals were taken at the age of 21 to 24 days from the stock colony raised on the regular stock ration (E. S. R., 50, p. 765). After 134 days on the experimental ration the rats were killed with ether and the two femurs and humeri were dissected out from the fresh tissue, dried, extracted with ether, and incinerated in an electric muffle furnace for 3 hours for ash determinations.

With increasing amounts of skim milk, from 2 to 20 cc. per day, there was an increase in the percentage of ash from 53.58 and 53.44 to 65.42 and 66.21 per cent for femur and humerus, respectively. With whole milk a similar increase was shown, the values increasing from 61.82 and 61.94 per cent for 0.5 cc. of milk to 66.79 and 67.2 for 5 cc., respectively. Motor disturbances were noted in the animals receiving less than 20 cc. of skim milk or 1 cc. of whole milk daily. This shows a correlation between the amount of fat-soluble vitamins, occurrence of motor disturbances, and deficient ash content of the bones.

Data were then obtained on the total ash content of the bones and the amount of inorganic phosphorus and calcium in the blood of normal rats on the stock diet at ages of 24, 35, 52, and 66 days, and of two full grown stock rats, the ages of which were not known.

The bones showed a progressive increase in ash content which had not reached its maximum after 66 days, when it totaled about 60 per cent. The ash content of the bones of the larger stock rats was about 66 per cent. The blood phosphate and calcium were slightly higher in the very young than in the older animals. The average figures for calcium for the different ages were 13.64, 11.70, 11.47, 11.66, and 10.5 mg. per 100 cc., respectively, and of phosphorus 10.1, 9.42, 9.34, 9.08, and 8.89 mg., respectively.

Analyses of the blood and bones of rats which had received in addition to a basal diet deficient in calcium various calcium salts furnishing the same amount of calcium showed uniformity in the total ash of the bones and the calcium and phosphorus content of the blood. When no calcium was added the animals were in poor nutritive condition, the ash content of the bones was materially reduced, and the calcium of the blood slightly reduced, while the phosphorus showed no variation.

Having demonstrated that the composition of the bones can be definitely related to age and to the calcium content of the diet while that of the blood remains quite constant, a further study was made of these relations with respect to the minimum requirements of calcium and phosphorus, with the addition of varying amounts of cod liver oil as a source of antirachitic vitamin. Two series of experiments were conducted. In the first the cod liver oil and calcium were each fed at different levels with the phosphorus remaining constant, and in the second the calcium was kept constant and the cod liver oil and phosphorus were varied.

On the synthetic diet furnishing no fat-soluble vitamins there was no growth even with the addition of abundant calcium. That this was not due entirely to vitamin A deficiency was shown by the failure of ophthalmia to develop in a number of cases. Lack of antirachitic vitamin is thought to be chiefly responsible. With varying amounts of calcium and 0.1 per cent of cod liver oil the amount of growth was proportional to the calcium addition up to 1 per cent of calcium carbonate, representing 455 mg. of calcium per 100 gm. of ration. Beyond this amount growth was depressed. By keeping the calcium constant and increasing the cod liver oil similar results were obtained, showing a mutual interdependence. Analyses of the bones showed that, in the absence of additional vitamin, calcium additions had only a minimal effect in increasing the ash content. Absence of calcium, with excess of cod liver oil, had the same effect. With the addition of both calcium and cod liver oil, bone calcification was normal with 1 per cent of calcium carbonate and 0.1 per cent of cod liver oil. The blood analyses showed a similar relation between growth and calcium concentration. There was a slight tendency of the phosphorus of the blood to be reduced as the calcium increased.

In the phosphorus series, the addition of phosphate did not lead to increased growth or change in the composition of the blood, thus showing that with the basal diet furnishing 18 per cent of calcium the phosphorus requirements of the rat are met. When no fat-soluble vitamins were added the calcium of the blood was consistently lowered, with apparently the greatest depression when the most phosphate was added. Radiation with ultraviolet light for 10 minutes daily brought up both the calcium and the phosphorus of the blood.

The effect of fasting and of vitamin B deprivation on the chemical composition of rats' blood, H. A. MATTILL (*Soc. Expt. Biol. and Med. Proc., 20 (1923), No. 8, pp. 537, 538*).—This is a repetition and continuation of previous work (E. S. R., 46, p. 62). As in the previous study, normal values were obtained, with the exception of figures for creatinin and creatin, in the blood of rats deprived of vitamin B and for the nonprotein nitrogen of the blood of fasting rats, which was from 30 to 40 per cent higher than that of normal animals. When, however, the fasting rats were forced to drink water during the last days of the fast, normal values were obtained for the nonprotein nitrogen of the blood. It is suggested that the high values obtained in ordinary fasting represent an increased concentration of the blood, which is overcome by forced water intake.

Influence of the nature and the quantity of carbohydrates present in the ration deprived of vitamin B upon the rapidity of appearance of symptoms of avian polyneuritis [trans. title], L. RANDOIN and H. SIMONNET (*Compt. Rend. Acad. Sci. [Paris], 177 (1923), No. 19, pp. 903–906, fig. 1*).—On a basal diet of vitamin-free meat 7.5, casein 8.5, butterfat 4, potato starch 66, agar 8, filter paper 2, and artificial protein-free milk 4 parts, it is stated that pigeons receiving 75 gm. of the ration (furnishing 50 gm. of starch) do not show signs of polyneuritis for 3½ months, but that on a lower ration of 30 gm. furnishing 20 gm. of starch [corrected in a later paper to 20 gm. furnishing 13 gm. of starch] the symptoms appear at the end of the second month. If starch is replaced by dextrin or glucose it is impossible to feed as large an amount of the ration. When the ration is cut down to 30 gm. (furnishing 20 of dextrin) there is a noticeable loss in weight at the end of 10 days, and the symptoms of polyneuritis appear in about 20 days.

It is suggested in conclusion that in making up an artificial food mixture for the study of deficiency disease, account should be taken of the utilization of each of the principal constituents of the diet. The requirement of vitamin B is thought not to be an absolute quantity for each animal but to be relative to the degree of utilization of one or more of the constituents of the rations, particularly the quantity of assimilable sugar.

Metabolic mechanism in beriberi, W. D. Fleming (*Philippine Jour. Sci., 23 (1923), No. 5, pp. 407–411*).—A comparison is reported of the metabolism of a number of beriberi patients in the wards of the Philippine General Hospital at Manila as compared with convalescents in the surgical ward showing no symptoms of beriberi or other conditions known to affect metabolism.

No significant difference was found in the basal metabolic rates or in the respiratory quotients of the two groups, while slight differences were apparent in the percentages of the heat derived from the combustion of protein, fat, and carbohydrate between the two groups. These are not considered to be of any importance, as all were within the limits of normal metabolism. No evidence was found of damage to the excretory power of the kidneys in beriberi in patients either with or without edema.

The influence of the diet during the preexperimental period on the susceptibility of rats to rickets, A. F. Hess, M. Weinstock, and E. Tolstoi (*Jour. Biol. Chem., 57 (1923), No. 3, pp. 731–740*).—Evidence is presented that rats may occasionally fail to develop rickets on any of the standard rickets-producing diets, whether low in calcium or in phosphorus. This failure was traced to the liberality of the diet of the mother and young during the preexperimental period of four weeks, and the resistance to rickets was overcome either by feeding a less adequate diet during that period or by means of inadequate lactation through giving the mother additional young to suckle with her own litter.

"Experiences of this kind indicate the necessity of controlling the diet of experimental animals for the entire period preceding the test. They also suggest that the diet of infants during the first weeks of life may be of equal importance in relation to the later development of rickets."

Strengthening the ultraviolet light therapy of rickets by oral administration of eosin [trans. title], P. György and K. Gottlieb (*Klin. Wchnschr., 2 (1923), No. 28, pp. 1302, 1303*).—The reports are given of 14 cases of rickets which were successfully treated by a combination of ultraviolet light therapy with eosin treatment for the purpose of sensitizing the body to the light. The eosin was given with each meal in 0.1 gm. doses mixed with 0.2 gm. of cane sugar. In some cases the ultraviolet light treatment was continued over the same length of time but with shorter exposures, and in others over a shorter length of time but with single exposures nearly equal to the usual periods of light treatment. The use of eosin appeared to hasten the curative processes and to increase the blood phosphorus, and is recommended for cases uncomplicated by tetany.

Kidney hypertrophy produced by diets unusually rich in protein, T. B. Osborne, L. B. Mendel, E. A. Park, and D. Darrow (*Soc. Expt. Biol. and Med. Proc., 20 (1923), No. 8, pp. 452, 453*).—A preliminary report is given of the condition of the various organs of rats which had grown to considerable size on diets containing 90 per cent or more of protein (E. S. R., 45, p. 764).

The only striking change from normal was in the kidneys, which were greatly hypertrophied but showed on microscopical examination no change of an inflammatory or degenerative nature. The hypertrophy occurred whether the protein used was of animal or vegetable origin and was rich or poor in phosphorus. This observation is of interest in connection with the widespread popular belief that a high protein diet in man is a renal irritant.

Methods of administering iodin for prophylaxis of endemic goiter, R. OLESEN (*Pub. Health Rpts.* [*U. S.*], *39* (*1924*), *No. 2, pp. 45–55*).—This is a survey of methods now in use for the administration of iodin for the prophylaxis of endemic goiter, particularly among school children. The method most in favor at the present time is the administration of a chocolate tablet containing 10 mg. of iodin in the form of an organic acid. One or two of these tablets should be given each week during the school year to both boys and girls between the ages of 11 and 16. A list of 24 references to the literature is appended.

Energy expenditure in the "daily dozen," M. M. JUSTIN (*Nation's Health*, *5* (*1923*), *No. 5, pp. 273, 274*).—The energy expended in going through a widely advertised system of setting-up exercises was computed from determinations of the amount of the respired air and its composition. The method of observation consisted in the use of the Douglas bag with mouth piece and inspiratory and expiratory valves. The respiratory quotient was calculated and the expenditure of energy in calories per minute. The results obtained were compared with similar data for energy expended at rest and walking.

The figures presented show a total energy expenditure, for the whole series of setting-up exercises completed in 13 minutes, of 41.9 calories per minute, as compared with 22.7 calories per minute when sitting at rest for a like period of time.

The experimental data reported, according to the author, show that while some of the exercises in the "dozen" are quite moderate in character, others involve a very considerable energy expenditure or muscular exertion. This is particularly true of the "crouch," which consists of deep knee bending. It is true also to a slightly less extent of the "weave" and the "wing," in which the trunk is quite vigorously turned and flexed. In the "crouch" the energy expenditure considerably exceeds, and in the other two mentioned it approaches, that of rapid walking.

"The comparison of these exercises with the exertion of rapid walking gives, however, a decided underestimate of their vigor. Walking is the most efficient exercise of which the body is capable. . . . On the other hand, the small number of muscles taking part in an artificial exercise requires that, if the total energy expenditure is approximately the same as that in walking, the particular muscles involved must make a very much greater exertion than do any of the muscles in walking. From this point of view some of the exercises, particularly those above mentioned, and to a considerable extent others also, are seen to involve a decidedly strenuous exertion. It is an exertion also which for the beginner is of a sort quite different from those which the muscles habitually perform. It is therefore correspondingly more severe.

"While some of the exercises are mild, the use of the more strenuous parts of the series by the aged or by those in poor condition, should be begun with caution, and should be increased from day to day very gradually. Indeed for such persons, certain of the exercises, particularly the 'crouch,' were better omitted.

"The phonographic musical accompaniment and directions increase the pleasure and vigor of the performance of these exercises, and are to be commended for all except the more strenuous numbers in the series." To determine the relative vigor with which the entire series of exercises was performed when the phonograph records were used simultaneously in comparison with the exercises without music and vocal directions, a few observations were made with two men and two women as subjects. The energy expenditure in this test was not determined during the exertion, but measurements were made during the five minutes immediately following. It is pointed out that the method followed does not offer exact information regarding the amount of energy expended during the exercises. "But as it is now known[1] that the recuperative processes in muscle proceed for a period after external work is terminated, such observations may be utilized for the comparative purpose to which they are here put."

As recorded data show, the pulse rate was increased by the exercises with music to 150 per cent of the resting value, and to only 125 without music. "The volume of air breathed and the energy expenditure in calories varied, as is usually the case, in closely proportional amounts, namely 269 and 262 per cent of the resting value after exercise with music and 165 and 164 without music. The figures for 10 minutes after the exercise show similar relations, but are not quite so closely parallel."

ANIMAL PRODUCTION.

Animal nutrition research, T. B. Wood (*Jour. Farmers' Club [London], 1923, pt. 5, pp. 83–99*).—This is essentially an historical sketch of the development of research work in animal nutrition, beginning with the work of Thaer. Discussions of certain phases of animal nutrition work were also given by C. C. Crowther and others.

A study of the effects of pumpkin seeds on the growth of rats, B. Masurovsky (*Jour. Agr. Research [U. S.], 27 (1924), No. 1, pp. 39–42, figs. 2*).—In a seven week's experiment carried on at the Nebraska Experiment Station, it was found that when pumpkin seeds replaced half of the basal ration of growing rats no injurious effects were produced. The growth rate during the first week after the substitution was increased as compared with the control rats. Rats receiving pumpkin seeds as the sole diet made poor growth, however. Two male rats from the same litter were fed in each group.

The kinetics of senescence, S. Brody (*Jour. Gen. Physiol., 6 (1924), No. 3, pp. 245–257, figs. 7*).—The author shows that the course of senescence, as measured by vitality and when not complicated by the process of growth, follows the course of a monomolecular chemical reaction, but that when growth is concerned the course is that of the accumulation and disappearance of a substance as the result of two simultaneous consecutive monomolecular chemical reactions.

The influence of pedigree stock on ordinary farm animals, A. Mansell (*Jour. Farmers' Club [London], 1923, pt. 6, pp. 101–119, fig. 1*).—This is a general discussion of the influence of purebred sires on grade and scrub stock, based largely on a summary of statements from farmers, with short discussions by members of The Farmers' Club.

Inspection of commercial feeding stuffs, H. R. Kraybill and T. O. Smith (*New Hampshire Sta. Bul. 209 (1923), pp. 44*).—The analyses of the samples of feeding stuffs officially inspected during 1923 are tabulated, and information on the operation of the feeding stuffs law, meaning of feed analyses, and methods of balancing rations is presented.

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[1] A. V. Hill, Physiol. Rev., 2 (1922), No. 2, p. 310.

Report of analyses of samples of feeding stuffs collected in New York State from January 1 to July 1, 1922, inclusive (*N. Y. State Dept. Farms and Markets, Agr. Bul. 149* (*1923*), *pp. 179*).—The guaranteed and found protein, fat, and fiber content of the samples of feeding stuffs officially analyzed from January 1 to July 1, 1922, are tabulated (E. S. R., 49, p. 167).

Livestock investigations [at the Fort Hays Substation] for the year 1921–22, C. W. McCampbell (*Kansas Sta., Fort Hays Substa. [Pamphlet], 1922, pp. 3–7*).—The results of cattle and sheep feeding trials are briefly described and tabulated.

The relative value of dry roughage and silage as the basis of a winter ration for growing steers.—In making this comparison, one lot of 19 steers received average daily rations per steer of 11.73 lbs. of wheat straw and 1 lb. of cottonseed cake during the winter of 1920–21 and 21.61 lbs. of sorghum hay and 1 lb. of cottonseed cake during the winter of 1921–22. In contrast another lot of 20 steers was wintered on 21.25 lbs. of sorghum silage and 1 lb. of cottonseed cake per head daily in 1920–21 and 43.1 lbs. of sorghum silage and 1 lb. of cottonseed cake in 1921–22. The average daily gains per steer were in the winter of 1920–21, 0.46 and 0.50 lb. in the respective lots, 1.31 and 1.42 lbs. on grass the following summer, and 1.11 and 0.95 lbs. per steer during the winter of 1921–22.

The comparative feeding value of cane with heads on and heads removed in the silo and in the shock.—Four lots of 10 cows each were selected for this test. In addition to the feeds compared, 2 lbs. of cottonseed cake were also fed per day. The average daily gains produced with the different types of feed were as follows: Cane silage with heads on —0.01 lb., cane silage with heads off —0.63, cane stover with heads off 0.85, and cane fodder with heads on 1.08 lbs.

The feeding value of straw and of silage as the basis of a winter ration for mature cows.—Five lots of 10 cows each wintered on comparative daily rations made average daily gains as follows: Wheat straw —0.30 lb., wheat straw and alfalfa hay 0.60, wheat straw and cane silage 0.79, cane silage 0.83, and cane silage and alfalfa hay 1.09 lbs. The results indicated that cows may be wintered on wheat straw alone, though loss in weight occurs. Silage alone produces some gains, but is not as good as when a protein-rich feed is substituted for part of the silage.

Alfalfa hay v. cottonseed cake as a protein supplement for dry roughage in wintering mature ewes.—One lot of 20 ewes wintered on average daily rations of 4.3 lbs. of threshed kafir stover and 1 lb. of alfalfa made average daily gains of 0.04 lb. as compared with gains of 0.09 lb. made by another lot wintered on a daily ration of 6.1 lbs. of threshed kafir stover and 0.33 lb. of cottonseed cake.

The value of linseed meal cake as a protein supplement in the winter ration for ewe lambs.—In another experiment, lots of 19 ewe lambs were wintered on similar rations to the above except that linseed meal replaced the cottonseed cake. The lot receiving silage lost an average of 0.01 lb. per day, while the lot receiving linseed meal gained an average of 0.05 lb. per day.

Beef cattle investigations [at the Fort Hays Substation], 1922–23 (*Kansas Sta., Fort Hays Substa. [Pamphlet], 1923, pp. 3–6*).—Results are reported of the following investigations:

The effect of dry and succulent winter rations upon summer gains.—Another year's results of the experiments dealing with the effect of winter rations on summer pasture gains of steers noted in the above report are given. During the summer of 1922 the lot receiving the dry roughage made average daily gains of 0.68 lb. as compared with 0.89 lb. by the lot receiving silage. During the winter of 1922–23 the dry roughage lot received 26.41 lbs. of kafir fodder and 1 lb. of cottonseed cake per steer daily, gaining 0.99 lb., while the other lot made daily gains of 0.82 lb. on a ration of 38.99 lbs. of kafir silage and 1 lb. of cottonseed cake. The average daily gains made by the lots from calves to 3 years of age were 0.88 and 0.89 lb. The amount of fat a steer carries when going to pasture seems to be the main factor in determining the gains to be made on pasture.

The relative value of different forage crops adapted to western Kansas conditions as winter rations for stock cattle.—Lots of coming 2-year-old heifers wintered on daily rations of 18.99 lbs. of cane hay, Sudan hay, or alfalfa hay made average daily gains of —0.006, 0.47, and 0.36 lb., respectively. Steers in another lot receiving 15.19 lbs. of Sudan hay and 4 lbs. of alfalfa gained 0.41 lb. per day, whereas a fifth lot receiving a like ration, with cane hay replacing the Sudan hay gained an average of 0.58 lb. per day.

Cattle feeding experiment No. 13, Government experiment farm, Gwebi, E. A. NOBBS (*Rhodesia Agr. Jour., 20 (1923), No. 5, pp. 543–554, pls. 3*).—Lots of grade Hereford, Shorthorn, Aberdeen-Angus, Devon, Sussex, and scrub cattle, mostly about three years of age, were fattened on a comparative basis during an 89-day feeding period in the winter on the same rations of home-grown feeds.

During the first 49 days of the test the animals received 9 lbs. of concentrates, 22 lbs. of dry roughages, and 18 lbs. of succulent feeds per 1,000 lbs. of live weight daily. The amount of concentrates was raised to 14 and the dry roughage and succulents to 25 lbs. each during the last 40 days of the test. The average daily gains of the lots were similar, being 1.8 lbs. for the Sussex and scrub lots, 1.9 lbs. for the Hereford and Angus lots, and 2.1 lbs. for the Shorthorn and Devon lots. The classification of the individual animals according to the percentage gained over original weight showed that they ranged from 30.3 to 7.1 per cent, with no one lot being uniformly at the top or the bottom of the rating. The preceding experiment in this series has been noted (E. S. R., 50, p. 270).

The influence of individuality, age, and season upon the weights of fleeces produced by range sheep, J. L. LUSH and J. M. JONES (*Texas Sta. Bul. 311 (1923), pp. 5–45, figs. 8*).—This is a more detailed report of the study previously noted by the senior author (E. S. R., 49, p. 871), with the addition of data collected on the spring shearings of 1923, and discussions of the practical application of these results in the improvement of the breeding flock. The work is based on 161 correlations between the weights of fleeces of ewes and wethers at the different ages over a six-year period.

Rice bran and rice polish for growing and fattening hogs, G. R. WARREN and D. W. WILLIAMS (*Texas Sta. Bul. 313 (1923), pp. 5–18*).—The results of one hog feeding experiment in which rice bran and rice polish were fed and another in which rice bran was fed are reported. Five lots of 5 Poland-China and 5 Duroc-Jersey pigs each, which had been previously fed on corn, shorts, tankage, and grass pasture, were selected for the first experiment, which lasted 60 days. For the second experiment, which lasted 150 days, 40 Duroc-Jersey pigs about 85 days of age were used. During the first half of this test the pigs were divided into two lots and fed sufficient amounts of grain in addition to pasture to keep them gaining without fattening. During the second part of the test the pigs of lot 1 were divided to form lots 1 and 2 and those from lot 2 were divided to form lots 3 and 4. The hogs were slaughtered at the conclusion of both experiments and the carcasses graded. The rations compared and the results are summarized in the following table:

Summary of hog feeding experiments with rice products.

Experiment.	Lot.	Ration fed.				Average initial weight.	Average daily gain.	Feed consumed per 100 lbs. gain.				Carcass grade.
		Corn chop.	Tankage.	Rice bran.	Rice polish.			Corn chop.	Tankage.	Rice bran.	Rice polish.	
		Parts.	*Parts.*	*Parts.*	*Parts.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	
1	1	90	8	------	------	140	1.73	361	32	------	------	10 hard.
1	2	40	8	50	------	140	1.59	169	34	212	------	5 hard, 5 slightly soft.
1	3	40	8	------	50	140	1.63	152	30	------	190	10 hard.
1	4	30	8	60	------	140	1.57	129	34	258	------	4 hard, 6 slightly soft.
1	5	30	8	------	60	140	1.33	120	32	------	241	9 hard, 1 slightly soft.
2	[1] 1	90	10	------	------	59	.91	319	35	------	------	
2	[1] 2	40	10	50	------	60	.74	174	44	218	------	
2	[2] 1	90	10	------	------	127	1.32	363	32	------	------	10 hard.
2	[2] 2	40	10	50	----	127	1.15	185	37	231	------	5 hard, 4 medium, 1 soft.
2	[2] 3	90	10	------	------	116	1.34	360	32	------	------	8 hard, 1 medium hard.
2	[2] 4	40	10	50	------	116	1.15	186	37	232	------	9 soft, 1 medium hard.

[1] First 75 days.

[2] Second 75 days.

The authors point out that none of the pork in the first experiment was sufficiently soft to be docked, but lot 4 in the second experiment contained 9 pigs which graded soft. Rice bran should, therefore, be discounted, at least temporarily, because of this tendency to produce soft pork when fed over a period of 150 days.

Cull raisins for hogs, E. H. Hughes (*Calif. Countryman, 10* (*1924*), *No. 1, pp. 9, 16*).—The results of a comparative hog-feeding test of dairy products, tankage, and raisins as supplements to barley are reported. These experiments were carried on in continuation of those previously noted from the California Experiment Station (E. S. R., 47, p. 573). The tankage used was of a low grade, testing only 45 per cent of protein, and contained impurities such as sand and gravel. There were 10 hogs in each lot. The following table summarizes the results:

Comparative tests of supplements to barley for hogs.

Lot.	Ration.	Method of feeding.	Length of tests.	Average initial weight.	Average daily gain.	Feed consumed per 100 lbs. gain.		
						Barley.	Raisins.	Protein supplement.
			Days.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	Rolled barley	Self-fed	112	47.80	0.498	591	--------	--------
2	Rolled barley and tankage	do	112	51.40	.906	346	--------	66
3	Rolled barley, raisins, and tankage	do	112	52.00	.986	213	129	91
4	Rolled barley and skim milk (1:3)	Hand-fed	98	54.33	1.611	276	--------	829
5	Rolled barley and whey (1:3)	do	98	53.33	1.329	324	--------	972
6	Rolled barley and condensed skim milk (4:3).	do	98	54.80	1.394	307	--------	230
7	Rolled barley and condensed whey (4:3)	do	98	52.87	1.352	322	--------	242
8	Rolled barley, raisins, and skim milk (1:1:6).	do	98	54.53	1.430	160	160	959
9	Rolled barley, raisins, and whey (1:1:6).	do	112	54.07	1.033	195	195	1,171
10	Dry cracked barley and tankage	Self-fed	112	51.87	.653	413	--------	66

Improving Philippine swine, I, B. M. Gonzalez and F. P. Lago (*Philippine Agr., 12 (1923), No. 6, pp. 251–256*).—Attempts to improve swine at the University of the Philippines have been severely handicapped by attacks of kidney worms on the improved stocks. Efforts to raise purebred Duroc-Jerseys and Berkshires have met with failure, as well as crosses between Duroc-Jersey boars and the native sows. Some success has accompanied the crossing of Berkshire boars on native sows, although there has been much infertility among the sow pigs, this being one of the results of attacks of kidney worms.

Feeding experiments with chickens [trans. title], N. O. Hofman-Bang (*Beret Forsøgslab. K. Vet. og Landbohøjskoles [Denmark], 112 (1923), pp. 5–61, figs. 3*).—The results of several feeding experiments carried on with Barred Rocks at Lundsgaard and with Barred Rocks and Brown Leghorns at the State farm at Trollesminde are reported.

From the results of these tests, the author has concluded that increases of from 87.5 to 105 gm. of feed per hen increased the number and weight of eggs produced. The necessary amount of feed for a hen, however, depends on her producing capacity. Chicks which were raised by means of self-feeders laid earlier and laid more and larger eggs than chicks which were fed limited amounts of feed. Less labor was also required with self-feeding. The replacement of grain by twice as much potatoes was found to be unsatisfactory for egg production. The necessity of green feeds was evident, as pullets began to lay earlier and hens receiving green feeds laid more eggs.

Brooding chicks for profit, R. E. Jones (*Conn. Agr. Col. Ext. Bul. 72 (1924), pp. 8, figs. 2*).—General directions for artificial brooding of chicks.

Brooding chicks artificially, J. E. Dougherty and S. S. Gossman (*California Sta. Circ. 271 (1923), pp. 29, figs. 13*).—This is a general description of approved methods of feeding, management, and housing of chicks brooded artificially.

Inexpensive labor-saving poultry appliances, J. E. Dougherty and S. S. Gossman (*California Sta. Circ. 268 (1923), pp. 32, figs. 24*).—Plans and directions for constructing trap nests, plain nests, feed hoppers, catching devices, water devices, a fattening crate, supply can, hatching egg cabinet, and an egg sorting table are given.

Poultry safeguards, Mr. and Mrs. G. R. Shoup (*Western Washington Sta. Bimo. Bul., 11 (1924), No. 6, pp. 121–124*).—The construction of a homemade alarm and thermostat for the incubator or brooder is described, and other suggestions as to the prevention of false molts and slumps in the egg production are given which are of primary interest to the practical breeder.

DAIRY FARMING—DAIRYING.

Dairy cattle investigations [at the Fort Hays Substation], 1922–23 (*Kansas Sta., Fort Hays Substa. [Pamphlet], 1923, pp. 6–8*).—Five cows receiving a grain mixture of ground kafir, bran, and cottonseed meal (4:2:1), with 9.4 lbs. of alfalfa hay daily during the first and third monthly periods and 8.5 lbs. of Sudan hay in the second period and 8 lbs. in the fourth period produced 3,922, 3,315, 3,330, and 2,868 lbs. of milk and 138.5, 117.3, 118.1, and 102.3 lbs. of fat in the respective periods. The live weight of the cows was not greatly changed during the alfalfa or the Sudan feeding periods. Suggested combinations of feed for dairy cattle which include Sudan hay are given.

In another experiment, an average of one acre of Sudan grass was found to carry a cow throughout the summer and produced in addition 2.3 tons of hay. The cows averaged 25 lbs. of milk per day and received 1 lb. of grain per 5 lbs. of milk produced.

Dairy farming in Victoria, J. S. McFadzean (*Jour. Dept. Agr. Victoria, 21 (1923), No. 2, pp. 65–81, fig. 1*).—The conditions in Victoria tending to be favorable to dairy farming and the principles to be observed in breeding, feeding, and selecting the dairy herd are discussed.

Clean and cold milk, R. S. Breed (*New York Sta. Circ. 69 [1923], pp. 4, figs. 2*).—A popular presentation of the necessity of cleanliness in the barn and of utensils and the proper cooling for the production of clean milk with a low bacterial count.

The relation between the clumps of bacteria found in market milk and the flora of dairy utensils, W. A. Whiting (*New York State Sta. Tech. Bul. 98 (1923), pp. 3–36*).—The results of a study of the relationship between the size of the clumps of bacteria found in market milk and the bacterial flora of dairy utensils, carried on at the New York State and Cornell Experiment Stations, are reported in three parts.

I. *Average size of the clumps of bacteria in market milk.*—The number of bacteria per clump found in 3,480 samples of market milk from Geneva and 150 samples from Ithaca have been determined microscopically. Five types of organisms were differentiated in the examination, *Streptococcus lactis*, streptococci other than *S. lactis*, micrococci, rods, and yeast. The average size of the colonies varied with the type of organism and with the bacterial content of the milk, the clumps being smaller in lower-count milk. The averages for all grades of Geneva milk were for clumps of streptococci 26.8, *S. lactis* 2.8, micrococci 12.3, rods 5.8, and yeast 5.5. The average size of all clumps was 11.1. The clumps in the Ithaca milk were much smaller, averaging 4.1 organisms, largely due to the less frequent occurrence of long-chain streptococci.

II. *Study of the size of the clumps of bacteria in the condensation water of milk cans.*—Smears successfully made from the condensation water in 28 milk cans showed the presence of very large bacterial clumps of micrococci, averaging 151 organisms, and of rods averaging 528 organisms per clump. No streptococci were observed. Since such large clumps were found in the cans, an effort was made to determine if can contamination of the milk could be detected at a central New York creamery. Of 15 producers of milk suspected of can contamination, it was found that 10 were leaving the lids on without rinsing or drying the cans before use. After drying their cans, the milk from these producers did not contain any large clumps of bacteria. The other 5 producers had milking machines, but 2 of them eliminated the large clumps of organisms by drying the cans.

III. *The bacterial flora of milk cans.*—In a study of the bacterial flora of milk cans from four milk plants in Ithaca, some of which were properly dried whereas others were not, 357 types of bacteria were isolated, of which 29 were selected for a careful study. About 50 per cent of these selected types produced undesirable changes in the milk. The cultural characteristics and morphology of each of the 29 types are described in detail. In conclusion, the author emphasizes the importance of properly cleaned dairy utensils for the production of milk containing low bacterial counts.

Does commercial pasteurization destroy tubercle bacilli in milk? C. J. Bartlett (*Amer. Jour. Pub. Health, 13 (1923), No. 10, pp. 807–809*).—By collecting samples of milk before and after pasteurization from the New Haven milk supply, centrifuging them, and injecting some of the sediment and cream subcutaneously into the thighs of guinea pigs, it was found at Grace Hospital that nearly 50 per cent of the raw samples produced tuberculosis, whereas no tuberculosis resulted when the injections were made from pasteurized milk.

Bacteriological background of butter making.—II, Proper farm care of milk and cream for butter making, G. L. A. Ruehle (*Michigan Sta. Quart. Bul., 6 (1924), No. 3, pp. 133–135*).—In continuing this series of papers (E. S. R., 49, p. 878), the necessity of using clean utensils and of proper cooling in the production of cream containing low bacterial counts is discussed. Reference to off-flavors and odors imparted through metallic salts and certain feeds is also made.

Measuring quality in ice cream, R. C. Fisher and H. F. Judkins (*Creamery and Milk Plant Mo., 13 (1924), No. 1, pp. 73–75*).—A score card for ice cream is proposed and discussed, allowing 50 per cent for flavor, 25 for body and texture, 20 for fat and solids, and 5 per cent for package and color.

Factors which produce quality in ice cream, H. A. Ruehe (*Creamery and Milk Plant Mo., 13 (1924), No. 1, pp. 88, 91*).—The factors affecting quality in ice cream are discussed and a score card is suggested, allowing 20 points for cleanness of flavor, 20 for richness, 10 for flavoring material, 25 for texture, 15 for resistance, 5 for color, and 5 for package.

Studies at Storrs show what produces quality, R. C. Fisher (*Ice Cream Trade Jour., 20 (1924), No. 3, pp. 71–74, figs. 6; also in Creamery and Milk Plant Mo., 13 (1924), No. 4, pp. 89, 90, 92, 94, 96, figs. 6*).—The results of studies at the Connecticut Storrs Experiment Station dealing with the factors affecting quality in ice cream, in addition to those previously noted (E. S. R., 50, p. 378), are presented graphically and popularly discussed.

Increases in the butterfat content up to 12 per cent were found to improve the flavor materially. Increases in the milk solids-not-fat up to 10 or 12 per cent improved the body and texture, but when over 12 per cent tended to produce a heavy, soggy, and sandy body and texture and a condensed or cooked flavor. Homogenization increased uniformity and improved the body, texture, and standing up qualities of the ice cream.

VETERINARY MEDICINE.

On the vermicidal value of iodin, with notes on two new iodin preparations and suggestions as to their probable therapeutic and disinfectant values, W. L. Chandler (*Michigan Sta. Quart. Bul., 6 (1924), No. 3, pp. 112–119*).—This is an account of work conducted during the past three years with iodin as a vermicide in the treatment of stomach worms of sheep, roundworms of swine, and hookworms of foxes. The various strengths and amounts of aqueous and saline solutions of various iodin preparations giving free iodin in solution failed to give satisfactory results in the treatment of such worms.

The author's investigations resulted in the production of a crystalline form of iodin which differs from sublimed iodin in many important respects. "It appears to be more readily soluble in water, castor oil, and other solvents of iodin. It immediately gives a saturated aqueous solution containing about 0.04 per cent iodin. Moreover, aqueous solutions appear to have a disinfectant value much greater than any of the known iodin solutions, the saturated aqueous solution being approximately 20 times as strong as is necessary to kill encapsulated hookworm larvae when two or three drops of distilled water containing washed specimens are placed directly into 10 mils of the dilute solution (titrating 0.002 per cent iodin), and . . . the aqueous solution appears to have a phenol coefficient about two and one-half times that of solutions of sublimed iodin containing the same amount of iodin. The exact nature of this preparation, which we shall for the present term as 'hyperactive' iodin, is still problematical."

In the summer of 1922, following this discovery, the author found that comparatively strong castor oil solutions of the hyperactive iodin crystals (1 gm. per ounce) were apparently highly efficient as a vermicide for use against ascarids and hookworms in the silver fox, ascarids in swine, ascaridia of poultry, and, when it entered the caeca, the heterakids of poultry. In experiments which followed in the winter of 1922–23, carried on with a large number of swine, sheep, and poultry, in which castor oil solutions of the hyperactive iodin crystals and a casein iodin compound were used, it was demonstrated that 4 oz. of castor oil containing 1 gm. of the iodin per ounce of oil was apparently 100 per cent efficient against ascarids in swine, and that 0.5 oz. of castor oil solution of the same strength was 100 per cent efficient against ascaridia in poultry and about half the time 100 per cent efficient against heterakids. One oz. of the castor oil solution administered to a man by means of a duodenal tube was effective in removing hookworms. The castor oil solution apparently failed to remove stomach worms from sheep.

"The casein compound when administered to swine, either by mixing it with a small amount of feed or by giving it in capsules, appeared to be highly efficient against ascarids. The dried powdered casein compound suspended in 4 oz. of mineral oil appeared to be 100 per cent efficient against stomach worms of sheep, and, given in large amounts, apparently also removed hookworms and nodular worms from the intestines of sheep. The various small strongylids of the fourth stomach and intestines of sheep were little affected by the compound. The mineral oil suspension of the casein compound also gave promising results in the treatment of poultry for ascardia and heterakids. The various tapeworms of poultry are apparently little affected by iodin."

During the summer of 1923 a new protein iodin compound was prepared which appears to be far superior to anything yet produced as a vermicide, and has been designated "vermiodin." It is a black powder of light weight, which by nature of its composition is capable of liberating, gradually, free iodin in the fourth stomach of sheep and in the small intestine of various animals. It appears advantageous to mix it to a thin paste with mineral oil. Experimental work with foxes shows that globules composed of vermiodin (12 to 15 grains) and mineral oil in soft gelatin give the most satisfactory results for the treatment of ascarid and hookworm infestations in foxes. Of the various iodin preparations tried against stomach worms of sheep the vermiodin appears to be the most promising.

Some new principles in bacterial immunity, their experimental foundation, and their application to the treatment of refractory infections, G. DREYER (*Brit. Jour. Expt. Path., 4 (1923), No. 3, pp. 146–176, figs. 3*).—On the theory that the customary failure in bacterial therapy and prophylaxis with acid-fast, Gram-positive bacteria is due to the presence in these microorganisms of waxy or lipoidal substances, the author attempted to remove by extraction the lipoidal fraction of some representative acid-fast, Gram-positive organisms, taking tubercle bacilli as the first to be tested. After a number of unsuccessful attempts, it was found that by treatment with formalin and subsequent extraction with acetone the bacilli could be rendered nonacid-fast and Gram-negative, and that the bacilli thus treated no longer resisted the digestive action of trypsin. The procedure as applied to *Bacillus tuberculosis* is as follows:

A two or three weeks' culture of the bacilli on glycerin broth or other suitable liquid medium is transferred to an agate mortar and ground to a thick homogeneous paste with a few drops of formalin. More formalin is then added gradually until a suspension is obtained of about 5 gm. of the bacilli in from 150 to 200 cc. of formalin. This is transferred to a flask with a reflux condenser, and the flask is immersed in a water bath which is kept at 100° C. for 4 hours. The suspension is then filtered through calcium-free filter paper, and the residue, after washing three or four times with acetone, is transferred to an extraction thimble that is placed in a Soxhlet apparatus with ground glass joints. This is heated in a water bath at from 65 to 70° for from 20 to 24 hours. The residue is then taken out, dried, ground in a sterile mortar, and tested for acid-fastness. The entire process is repeated as many times as necessary to render the organisms nonacid-fast.

In preparing the antigen 0.1 gm. of the dried extracted bacilli is weighed out and ground up in a mortar with sterile 0.9 per cent salt solution, added drop by drop until a thick homogeoneous paste is obtained. This is diluted gradually to 10 cc., placed in a sterile centrifuge tube, and centrifuged for from 5 to 8 minutes at 3,000 r. p. m. The supernatant fluid is pipetted off and diluted with sterile 0.9 per cent salt solution containing 0.15 per cent formalin until 1 cc. of the suspension contains 0.0002 mg. of the dried defatted bacilli. This is determined by drying and weighing the residue in the centrifuge tube. The suspensions for use are made up from this stock suspension as required, the concentration depending upon the use to which it is to be put.

The injection into normal rabbits of the defatted T. B. antigen as thus prepared resulted in the formation of specific complement fixing bodies, precipitins, and agglutinins as shown by test tube experiments. The details are also reported of the use of this antigen in the treatment of four guinea pigs and four rabbits infected with human and bovine tubercle bacilli. All of the cases showed definite improvement both general and local. Preliminary reports are also given of the use of antigens similarly prepared in the treatment of human tuberculosis.

A few experiments with *B. anthracis* are reported. The sera of two rabbits immunized with defatted anthrax antigen were found to contain complement fixing substances, precipitins, and agglutinins. The work reported is thought to afford an explanation of the immunizing properties of Pasteur's anthrax cultures attenuated by growth at from 42 to 43°. Growth at this temperature is assumed to give rise to a deficient formation of the fatty constituents of the bacilli, thus rendering them less Gram-positive. A few tests are reported in confirmation of this assumption.

The general nature of the hypothesis advanced in this investigation is shown by like results with other Gram-positive organisms, including *Staphylococcus aureus*, streptococcus, and *B. diphtheriae.*

Immunologic identity of Bacillus arbortus and Malta fever germ [trans. title], L. Auricchio (*Pediatria* [*Naples*], *32* (*1924*), *pp. 57–68; abs. in Jour. Amer. Med. Assoc.*, *82* (*1924*), *No. 8, p. 663*).—Immunologic tests by the author have shown *B. abortus* and the Malta fever organism to be similar. Children affected with Malta fever were treated with *B. abortus* vaccines with as good results, and even more active serologic reactions, as when a specific Malta fever vaccine had been injected.

The relation of high cellular counts to Bacterium abortus infection of the udder, R. L. Tweed (*Michigan Sta. Tech. Bul. 61* (*1923*), *pp. 28*).—This publication reports the results obtained in determinations of the cellular counts of samples of milk from 96 different cows in various herds. The milk was selected by the combined agglutination and complement fixation tests, and active infection was detected by guinea pig inoculation and bacteriological examination of the milk.

Only 17 of the cows tested were found to be actively infected with *B. abortus* in one or more quarters during the experimental period. Of the 78 cows which did not show active infection, the milk of 8 gave positive agglutination and complement fixation tests in one or more quarters, but failed to produce any lesions in guinea pigs. In none of these cases could the organism be isolated.

The cellular counts in the milk from actively infected udders, while not so high as reported by Cooledge in a previous study (E. S. R., 41, p. 578), were more than twice as high as those found in the milk from noninfected udders. The antibody content of the foremilk and strippings of the infected animals was practically the same, but the cellular count was higher in the strippings than in the foremilk. The foremilk produced typical *B. abortus* lesions in guinea pigs, but the strippings did not.

Histological studies showed that leucocytes and not epithelial cells predominated in the milk from both infected and noninfected udders. The cells were not found in sufficient quantities, however, to indicate either a catarrhal or a suppurative condition.

From a limited number of H-ion concentration determinations and the measurement of the carbon dioxid by volume in the milk, it is concluded that an increased cell count gives a decrease in the H-ion concentration.

Controlled vaccination experiments on cattle with Bacterium abortum, G. H. HART and C. M. CARPENTER (*Jour. Amer. Vet. Med. Assoc., 64 (1923), No. 1, pp. 37–61, fig. 1*).—Experiments conducted at the California Experiment Station, here reported, are considered to demonstrate clearly the value of living cultures of *B. abortum* in preventing abortion in the vaccinated animals when subjected to identical infection that produced abortion in the controls. Nine of the 30 vaccinated animals have to date failed to conceive, and no other explanation can be offered for this sterility except the vaccination.

The ability to produce abortion in susceptible animals by a single exposure to infectious material given by ingestion was demonstrated. The abortions in these cases occurred from 58 to 88 days after the infection. Although the animals in one group did not abort, the immunity was not sufficient in all cases to prevent *B. abortum* from remaining viable in their bodies, as shown by its demonstration in the colostrum of 4 of the animals. *B. abortum* has not been recovered from the placentae or colostrum of these animals of another group which did become pregnant and which was subject to vaccination only. When suppuration develops as the result of the vaccination, the organism will be found for many weeks in the discharge from such areas.

Experimental studies on foot-and-mouth disease [trans. title], D. MEZINCESCU, V. BARONI, and I. CALINESCU (*Ann. Inst. Pasteur, 37 (1923), No. 12, pp. 1057–1063*).—A brief report is given of miscellaneous studies on foot-and-mouth disease conducted during 1913–14. These may be summarized as follows:

The virus obtained from lymph or from ruptured mucous membranes, after filtration on Berkefeld candles, showed no appreciable growth when seeded on various culture media under anaerobic or aerobic conditions. It was destroyed in collodion sacs in the peritoneal cavity of young pigs and chickens in less than four days. When a filter candle filled with a mixture of virus and Martin's bouillon was placed in the peritoneal cavity of pigs, the animals were rapidly infected.

In the serum of animals immunized artificially or naturally, tests for the presence of antibodies gave negative results. Attempts to infect rabbits by intracerebral, intravenous, intratesticular, and intraocular injection gave negative results. Of the various methods of inoculation, intraocular proved the most delicate in the case of cattle. The disease following this method of inoculation appeared after a shorter incubation period, was more severe, and conferred a greater degree of immunity than that following inoculation by any other means.

Monkeys were successfully inoculated with foot-and-mouth disease virus, showing typical eruptions and elevations of temperature after an incubation period of from three to five days.

[Symposium on foot-and-mouth disease] (*Vet. Jour., 80 (1924), No. 585, pp. 93–142*).—Papers here presented include an editorial on The Present Outbreak of Foot-and-mouth Disease in Great Britain (pp. 93–97); Foot-and-mouth Disease in the Army and on Active Service, by J. Moore (pp. 99–105); Foot-and-mouth Disease in India, by Baldrey (pp. 106–111); Foot-and-mouth Disease from an Indian Standpoint, by F. Ware (pp. 111, 112); Trypan Blue in Injections in Foot-and-mouth Disease, by F. A. Davidson (pp. 113–123); The Future Control of Foot-and-mouth Disease, by Rainey (pp. 123–125); Ailments which Simulate Foot-and-mouth Disease, by J. Fox (pp. 125, 126); Foot-and-mouth Disease, by G. Mayall (pp. 126, 127); The Present Problem of Foot-and-mouth Disease in England, by J. A. Arkwright (pp. 127–131); Foot-and-mouth Disease in Rats, by J. M. Beattie and D. Peden (pp. 131–135) noted below; Explanation of the Outbreak in Aberdeenshire; Exoneration of Ireland (pp. 135–139); and Measures Taken Against Foot-and-mouth Disease in Switzerland During the Last Few Years, by M. L. Panisset (pp. 139–142).

Foot-and-mouth disease in rats, J. M. BEATTIE and D. PEDEN (*Lancet [London], 1924, I, No. 5, pp. 221, 222; also in Vet. Jour., 80 (1924), No. 585, pp. 131–135*).—The authors report experiments which show that foot-and-mouth disease can be produced in rats.

"Four rats which have been fed on, or inoculated with, cow glands have developed edematous swelling of both hind feet, two have shown, in addition, clear vesicles on the under surface of the feet or between the toes, two had vesicles on the tongue, three, and one mouse, had vesicles or patches of gelatinous edema in the lungs (the lungs of the fourth were not examined). One rat was vaccinated with a very small drop of the edematous fluid from the foot of an infected rat, and this animal also developed the edema of the feet, the vesicles on the under surface of the toes, vesicles in the tongue, and the gelatinous edema in the lungs."

The treatment of mal de caderas with tryparsamid, W. G. SMILLIE (*Jour. Amer. Vet. Med. Assoc., 63 (1923), No. 6, pp. 706–719, figs. 3*).—This is a report of studies at Sao Paulo, Brazil, by the International Health Board. It is pointed out that mal de caderas, due to *Trypanosoma equinum*, is the greatest economic problem of the whole vast Paraguay Valley, where it is enzootic and has caused tremendous losses every year. The results of the investigations have been summarized by the author as follows:

"Single doses of tryparsamid of from 5 to 8 gm. given intravenously to horses and mules suffering with mal de caderas are followed by a marked reduction of the parasites in the circulating blood. In a number of instances no trypanosomes could be found within 24 hours after treatment. In addition, there was a prompt cessation of fever and a pronounced physical improvement. In general the effect of such a dose lasted from one to three months. The administration of two doses of 8 gm., separated by an interval of three weeks, was highly effective. The 24 horses so treated remained well and active for nine months, while the 5 untreated controls had all died during the first three months.

"No toxic symptoms or other evidence of constitutional injury were observed to follow the administration of tryparsamid. On the contrary, pronounced general physical improvement was the rule. The treatment of animals in late stages of the disease offers only a problematical measure of success because of the marked involvement of the spinal cord, as evidenced by paralysis, and also because of the poor physical condition of the animals. It is suggested that the horse and mule may be the most important carriers of the disease and may serve as reservoirs of the infection from season to season. Two plans of procedure for the treatment and possible eventual eradication of the disease in a herd are suggested."

Bovine tuberculosis, L. Van Es (*Nebraska Sta. Circ. 23 (1924), pp. 3–66, pls. 11, figs. 5*).—This is a comprehensive summary of information on tuberculosis of livestock. A brief historical account first presented is followed by a consideration of the distribution and morbidity in European countries, as well as the United States. This is followed by discussions of the cause, virulent material, vehicles of infection, modes of infection, predisposing factors, lesions, symptoms, diagnosis, tuberculin, forecast and treatment, and economic importance; general principles and special methods of prophylaxis; its occurrence in other animals and in man; and the importance of meat and milk hygiene.

Special report on diseases of cattle (*U. S. Dept. Agr., Bur. Anim. Indus., 1923, rev. ed., pp. 563, pls. 56, figs. 24*).—This is a revised edition of the work previously noted (E. S. R., 36, p. 881).

Special report on diseases of the horse (*U. S. Dept. Agr., Bur. Anim. Indus., 1923, rev. ed., pp. 629, pls. 42, figs. 18*).—This is a revised edition of the work previously noted (E. S. R., 36, p. 884).

On the cause of some chicken diseases, H. J. Stafseth (*Michigan Sta. Quart. Bul., 6 (1924), No. 3, pp. 129, 130*).—This is a comparison, in tabular form, of the history or symptoms with the autopsy findings of diseases commonly called roup or colds, going light, leg weakness, turning disease, and blindness.

Prevalence of bacillary white diarrhea, H. J. Stafseth and W. L. Mallmann (*Michigan Sta. Quart. Bul., 6 (1924), No. 3, pp. 130–132, fig. 1*).—The authors present a map of the lower Peninsula of Michigan showing the distribution of bacillary white diarrhea infection.

An epizootic of bacillary white diarrhea in chickens [trans. title], L. Panisset and J. Verge (*Rev. Gén. Méd. Vét., 33 (1924), No. 385, pp. 19–21*).—A brief description is given of a severe epidemic of bacillary white diarrhea occurring among 1 to 15-day-old chicks. The microorganism isolated differed from *Bacterium sanguinarium* in that it did not form hydrogen sulphid nor produce acids from sugars, particularly lactose. It differed from *B. pullorum* in that there was no production of gas in the different carbohydrate media. Considerable success was obtained in the use of a vaccine prepared by heating to 60° C. a 24-hour culture of the organism in physiological salt solution. The vaccine, which contained about 20 million bacteria per cubic centimeter, was injected in 0.5–cc. doses in fowls and 0.1–cc. doses in chicks. Only one of the three fowls and one of the 25 chicks died following the injection.

Single tube method for determining carriers of Bacterium pullorum, F. R. Beaudette (*Jour. Amer. Vet. Med. Assoc., 64 (1923), No. 2, pp. 225–227*).—This is an account of a test perfected at the Kansas Experiment Station, which is equally as reliable as the old routine method and requires only one agglutination tube. By its use the time required for incubation is reduced by at least 24 hours.

Limberneck in chickens, L. P. DOYLE (*Jour. Amer. Vet. Med. Assoc., 63 (1923), No. 6, pp. 754–758, fig. 1*).—This report of investigations at the Indiana Experiment Station led to the conclusion that the common source of the toxic substance responsible for limberneck is carrion, or maggots from carrion. Maggots evidently play a passive part in carrying the poison produced in carrion.

"Limberneck is an important cause of loss among chickens during the warmer portion of the year. Neither the fly nor the maggot is essential for the development of a toxin capable of causing limberneck. The toxic substance in carrion and maggots is quickly destroyed by boiling. Polyvalent (types A and B) botulinus antitoxin did not protect against the toxin in carrion and maggots. Carrion and maggots from carrion are sometimes nontoxic for guinea pigs."

Attempts at immunization of rabbits against fowl cholera by the cutaneous route [trans. title], C. CERNAIANU (*Compt. Rend. Soc. Biol.* [*Paris*], *90 (1924), No. 7, p. 530*).—Unsuccessful attempts at immunization against fowl cholera by cutaneous injection of the vaccine are reported.

RURAL ENGINEERING.

Daily river stages at river gauge stations on the principal rivers of the United States, H. C. FRANKENFIELD (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 18 (1920), pp. II+182; 19 (1921), pp. 277; 20 (1922), pp. III+268*).—These volumes contain the daily river stages on the principal rivers of the United States for 1920, 1921, and 1922, and constitute the eighteenth, nineteenth, and twentieth of the series (E. S. R., 46, p. 688).

Cutting down curing period for concrete roads, H. F. CLEMMER (*Engin. and Contract., Roads and Streets, 61 (1924), No. 2, pp. 283–290, figs. 5*).—The results of an investigation conducted by the Illinois Division of Highways on the use of calcium chlorid in the hastening of the setting of concrete in roads are reported. It has been generally proved that calcium chlorid when used in the proper amounts does accelerate set and secures the same strength at the end of 14 days as can be obtained from the use of the various wetting methods in 28 days. Roughly, the action of this chemical is dependent upon its hygroscopic properties and its resulting ability to attract moisture from the air.

The investigations of the effects of external treatment showed that surface applications of dry calcium chlorid were far superior to the external use of solutions of the chemical. Specimens cured in this manner had a modulus of rupture much greater than those treated externally with 30 and 60 per cent solutions of calcium chlorid.

Studies of the properties of calcium chlorid applied externally to concrete led to the belief that the chemical served to prevent the formation of transverse cracks caused by shrinkage as a result of its property of maintaining the moisture content of the concrete at a high percentage during the first 48 hours. Further studies in the laboratory showed clearly that the concentration of the calcium chlorid used in curing is not the important factor in scaling, but that the degree of tamping is the main cause.

Treated surfaces showed an almost imperceptible wear after an abrasion test, while the untreated surfaces showed a distinct depth of abrasion under the same number of revolutions of the apparatus. Compressive and transverse tests made in conjunction with the determination of wear again demonstrated the superiority in strength of the chemically cured material. The early indications are that greater strengths of concrete may be secured by the use of external applications of calcium chlorid than by internal applications.

An orchard brush burner, W. L. ZINK (*California Sta. Circ. 269 (1923), pp. 10, figs. 11*).—Practical information on the construction of an orchard brush burner is presented.

Radiation characteristics of the internal-combustion engine, T. MIDGLEY, JR., and H. H. MCCARTY (*Jour. Soc. Automotive Engin., 14 (1924), No. 2, pp. 182–185, figs. 7*).—Studies are reported which showed that the radiation produced during internal combustion is a function of the chemical reaction involved to a much greater extent than are merely the temperatures of the gases. It is considered entirely possible that the high radiations recorded during detonation are as much a function of gas temperatures as they are of any difference in the chemical reactions involved.

Control of detonation, G. A. YOUNG and J. H. HOLLOWAY (*Jour. Soc. Automotive Engin., 14 (1924), No. 3, pp. 315–318*).—Studies conducted at the Purdue University Engineering Experiment Station on methods of controlling the temperature of the charge before and after the mixture enters the combustion chamber and before normal ignition occurs in an internal-combustion engine are reported. Previous tests made on a poppet valve engine and on a sleeve valve engine revealed the impracticability of applying the laboratory methods used at that time to commercial practice, and the need of eliminating difficulties inherent in those methods of detonation control. The various changes made in the engine are described, including the special design of spark plugs.

The conclusions drawn in tests covering a period of two years are that when reasonable care is exercised in maintaining the mixture, the spark plugs, the valves, and the combustion chamber at the proper temperature, a compression pressure of 125 lbs. per square inch can be used without detonation by the addition of a small amount of anti-knock compound to the fuel, with enough increase in the efficiency of the engine to warrant the additional expense. All the commercial spark plugs used were found to be the first cause of detonation. Spark plugs could be designed and built which would operate at a temperature low enough not to produce detonation and yet be practical.

Comparison of ideal and commercial carburetor characteristics, C. S. KEGERREIS (*Jour. Soc. Automotive Engin., 14 (1924), No. 3, pp. 286–301, figs. 21*).—In the first part of a contribution from the Purdue University Engineering Experiment Station, general information is presented to illustrate the ideal carburetor mixture requirements when using a fully developed acceleration device. In the second part computed data illustrate the carburetion requirements of various automotive vehicles for level operation and indicate the advisability of using straight-line mixtures. In the third part data are presented on commercial carburetors, the results of several devices are shown in detail, and the results of tests of 23 carburetors are reported. In the fourth part 11 devices are compared with the ideal carburetor at various speeds.

The desired characteristics, as established, are that the engine must develop maximum power at wide-open throttle, maximum efficiency must be maintained wherever possible, and proper acceleration must be provided when using economical mixtures. The carburetion requirements established are that vaporization and distribution must be correct in all cases. An average of the vehicles of the 1.25-in. carburetor class required nearly the same mixtures at the lower flow rates as those of the 1-in. carburetor class. The variation was mainly that slightly richer mixtures were required at the same flow rates. The 1.5-in. class was 7 per cent richer at certain lower flow rates. A straight-line mixture was found not to suffice for level road performance.

In the commercial carburetor tests the carburetor test plant and the 4-cylinder engine conditions showed the same characteristic metering results. The actual values of the mixtures checked in most cases. Four carburetors out of the 23 tested approached ideal metering requirements, and two of them nearly fulfilled these requirements. Critical or breakdown points in metering may occur at any flow rate, depending on individual carburetor design, and it is thought that most devices could be materially improved economically by providing means for full load compensation for power. The constant vacuum type of carburetor showed maximum flow for minimum constriction, and the fuel-air-proportioning type ranked second. The plain tube type, as usually designed, was found to be the most constricted.

It was found that 26 per cent of the carburetors tested should allow maximum power, 30 per cent should cause a high loss in power, and the remaining 44 per cent only average power losses. The effect of the intake air temperature upon any carburetor was found to depend on the type of carburetor, the method of air bleeding the fuel nozzle, the design and number of fuel orifices, and the method of throttling the fuel delivery nozzle by the use of a needle valve. An increase in the air temperature usually caused an enrichment of the mixture, varying approximately from 5 to 15 per cent per 100° F. for ordinary conditions.

It was further found that the normal carburetor as built and applied to automotive vehicles will show the best economy at speeds of from 20 to 30 miles per hour. The computed ideal mileage decreased with an increase in speed.

Winter tests show greater dilution with heavy fuels, J. A. C. Warner (*Jour. Soc. Automotive Engin., 14 (1924), No. 2, pp. 151–161, figs. 10*).—In a contribution from the U. S. Bureau of Standards the results of analyses of fresh crankcase oils and the dilution results are presented, and a comparison is made of those obtained under summer with those obtained under winter conditions from a large number of cars and trucks.

The winter tests showed a slight increase in average fuel consumption for an increase of 55° F. in the 90 per cent point of the distillation curves. This difference in economy is considered to be unimportant when compared with the estimated difference in the possible production of fuels of two extreme volatilities from a given quantity of crude oil. The more volatile fuels were superior as regards starting and general performance, and preference corresponded to the relative volatility arrangement between the 14 and 20 per cent points of the distillation curves.

The less volatile fuels gave the greater dilution, and similar fuels gave greater dilution in winter than in summer. Within the mileage range covered by the tests, dilution appeared to reach an approximate equilibrium after comparatively short runs. Actual crankcase oil consumption for all the tests averaged the equivalent of 476 miles per gallon.

A report of a series of parallel runs with a commercial gasoline and a special winter fuel is appended.

Mechanical friction as affected by the lubricant, L. H. Pomeroy (*Jour. Soc. Automotive Engin., 14 (1924), No. 3, pp. 307–312, figs. 2*).—Studies conducted to ascertain the relation of the lubricant to the internal friction of an internal-combustion engine at various speeds are reported. The principal sources of friction in an engine are enumerated as the crankshaft, camshaft, and connecting-rod bearings in rotation; the pistons and valves which slide; and the generator, pump, and distributor.

The experimental results showed that a variation in the viscosity of the lubricant can easily account for a reduced mechanical efficiency and, consequently, for the increased consumption of gasoline, and that the friction loss is proportional to the cubic capacity of the engine. On the other hand, the brake mean effective pressure for the same horsepower is inversely proportional to the capacity.

Tabular data are given showing the variation of the friction mean effective pressure at various speeds and at various temperatures of the water and oil, and the fuel consumption of the engine at part throttle and at varying oil and water temperatures. A method of calculating the reduction of the gasoline consumption, assuming a constant indicated thermal efficiency, is also advanced.

Results as determined from friction curves and from actual tests suggest that the thermal efficiency is affected but little by the water jacket temperatures, and that the saving on account of thermostats and radiator shutters is caused almost entirely by reduction in the viscosity of the oil. While the water temperature rises very rapidly, the oil temperature does not ordinarily rise more than 40° F. above atmospheric temperature and after prolonged fast operation the rise amounts to about 90°. Thus to obtain a mean oil and water temperature of 170°, the atmospheric temperature must be about 80° at a speed of approximately 40 miles per hour, while for ordinary slower operation the conditions of maximum efficiency are not realized unless the atmospheric temperature is about 130°.

In a study of methods of keeping dirt out of the crankcase, it was found that certain oils that worked well under normal conditions became too viscous in cold weather. The property of oiliness increased in importance as the bearing surfaces more nearly touched each other, and especially when the engine was starting from rest.

Viscosity of lubricants at high pressure and temperature, M. D. Hersey (*Jour. Soc. Automotive Engin., 14 (1924), No. 2, p. 188, fig. 1*).—Data on the viscosities of a number of lubricants over a greater range of pressures and temperatures than has hitherto been attempted are presented. They indicate especially how the viscosity varies with the temperature at high pressures.

Slip, friction, and stretch tests for leather belting, L. C. Morrow (*Amer. Mach., 60 (1924), No. 13, pp. 469–471, figs. 8*).—Information on methods of testing leather belting for slip, stretch, and frictional characteristics is presented. An example of an overloaded belt running without tension on the slack side is described.

Miniature thresher and separator, W. W. Mackie and A. H. Hoffman (*Jour. Amer. Soc. Agron., 16 (1924), No. 1, pp. 57–60, pls. 2*).—A new machine designed at the California Experiment Station for threshing and separating single bundle harvests from rod-row experimental plats is described and illustrated. This machine will clean itself automatically without stopping between bundles.

Dust explosion control difficult, H. W. Frevert (*Iowa Engineer, 24 (1924), No. 6, pp. 5, 6, 26, fig. 1*).—In a contribution from the Bureau of Chemistry, U. S. D. A., a summary is given of work conducted by the Department and other agencies on dust explosion control. It is pointed out that dust explosions and their causes are extremely hard to investigate because the force of the explosions destroys everything in the path, and because the widely varying dust mixtures which may cause the explosions are hard to keep in suspension for laboratory study.

The development and future of electric milking in New Zealand, L. Birks (*New Zeal. Jour. Sci. and Technol., 5 (1922), No. 5, pp. 250–253, fig. 1*).—Data on the development of electric milking in New Zealand are briefly presented and discussed. It is stated that the history of the development of electric power milking has been the replacement of the standard 3 h. p. oil engine, driving the ordinary releaser milking machines, by a 3 h. p. electric motor. This amount of power was found to be largely in excess of that actually required, and even 1 h. p. operated sufficient milking machines to deal with a herd of a hundred cows. Since a large proportion of the herds range from 10 to 20 cows, a plant capable of milking 2 cows at a time is all that is required. The final development is a compact type of machine capable of fulfilling this service and driven by a motor of only 0.25 h. p.

Chimneys for heating boilers, A. G. KING (*Dom. Engin., 106 (1924), No. 7, pp. 20–23, figs. 5*).—Information and tabular data for use in the design of chimneys for househeating boilers are presented.

Relation of sewer trench width to load on pipe, G. C. D. LENTH (*Engin. News-Rec., 92 (1924), No. 13, pp. 533–535, figs. 14*).—Data from different sources on methods of pipe laying and the relative bearing values of the different methods are summarized, and curves showing the loads in trenches of varying widths for different kinds and conditions of soil, computed from Marston's formula, are presented.

A farm septic tank, W. B. HERMS and H. L. BELTON (*California Sta. Circ. 270 (1923), pp. 16, figs. 15*).—Practical information on a small farm sewage disposal system adapted for California conditions is presented.

The radio receiving set, E. C. SAUVE (*Michigan Sta. Quart. Bul., 6 (1924), No. 3, pp. 124–128, figs. 4*).—Brief instructions relating to the construction of both simple crystal and tube receiving sets for use on farms are presented.

RURAL ECONOMICS AND SOCIOLOGY.

Rural economics and bookkeeping, F. TODARO (*Economia Rurale e Contabilità. Casale Monferrato, Italy: Marescalchi Bros., 1924, 3. ed., rev., pp. XII+435, figs. 2*).—The scope of the subject matter of rural economics is defined. The function and use of capital and cultural systems are set forth in detail in the first section. The second is devoted to farm account keeping methods and systems.

Adjusting production to meet home market demands in Blair County, Pa., R. B. DUNLAP, B. H. CRITCHFIELD, and M. V. CARROLL (*Pennsylvania Sta. Bul. 184 (1924), pp. 51, figs. 16*).—An economic survey and analysis of the quantity of food consumed, the sources of supply, the manner of marketing, and the methods of transportation in Altoona, Pa., is reported upon. The first part of the publication is descriptive of facilities of distribution. A survey was also made of the agricultural production of Blair County farms to show to what extent local producers were meeting the demands and how much readjustment was possible by farmers to produce profitably more of the commodities demanded. The second section comprises the production data, which were secured from 252 representative farms. These bear upon price trends, yields, production, acreage, and carlot movements of recent years. Dairy and poultry products, potatoes, vegetables, fruits, meat products, and cereals and hay are the commodities studied. The concluding section gives recommendations.

It is noted that as the farming of this region has shifted to dairying, poultry raising, potato growing, and in the river bottom sections to truck crops and berries, farm incomes have become steadier and more certain.

It is recommended that more attention be given to the keeping of accounts on the farm; and, with reference to changes in farming practices, more efficient dairy production rather than an increase in the number of cows, more attention to the production of heavy dressed poultry and first-class eggs, good quality potatoes, and the substitution of more profitable crops, especially corn, oats, barley, and alfalfa, for a portion of the present wheat area are advised. The opportunity for truck crop production under carefully considered conditions is pointed out, and growers are urged to improve the quality of market apples.

Labor requirements of Arkansas crops, A. D. McNair (*U. S. Dept. Agr. Bul. 1181 (1924), pp. 64, figs. 51*).—This presents in graphic and tabulated form data as to the quantity of man and horse labor expended on each of the important crops raised in Arkansas, distributed by months and by operations. All charts are made on the basis of 10 acres except those for a few fruit and vegetable crops and for rice, which are made on the basis of 1 acre and 100 acres, respectively. For the most important crops, such as cotton and corn, several charts for different parts of the State are shown, because labor requirements on a single crop vary according to soil, latitude, and other conditions. For muskmelons, watermelons, and sweet potatoes there are two charts each for different conditions. For strawberries and blackberries there are charts for the year of planting and other charts for the bearing crops. For oats there are charts for spring-planted and fall-planted oats. For wheat there is a chart for wheat planted on oat stubble and one for wheat planted after a crop of cowpeas. For cowpea hay there is a chart for an early-planted crop and another for a late-planted or second crop after small grain.

In gathering these data the survey method was used. At the beginning of the year 1914, the author obtained estimates of labor on cotton and corn from 29 farmers in Faulkner County, Ark., and then asked the same farmers to keep labor records. These farmers were visited once a month and the records inspected and collected. An estimate is made of the difference between the results obtained from the records and from the estimates, and it is held to be too small to influence the conclusions drawn. In gathering the data on labor requirements, it was found that an average of the estimates of 6 farmers was not materially different from an average of 10 to 12 estimates, hence 6 was the average number used. Readers are cautioned to make allowances for soil, weather, weediness of land, stumps and stones, length of rows, size of teams or power units, changed practices, and adjustment for yield in their interpretation of these tables and charts.

A skeleton form for the calculation of approximate costs is given and illustrated by being applied in the case of data for the production of cotton in Pulaski County, Ark. Directions are given for calculating crop systems from the labor standpoint for 36 and for 45 acres of land. A table is presented showing in the descending order of quantity the man labor required on 1 acre of the various crops.

Agricultural tribunal of investigation.—Second interim report, W. J. Ashley et al. (*London: Govt., 1923, pp. [2]+6*).—The opinion is recorded that more comprehensive measures than those suggested in the earlier report (E. S. R., 49, p. 388) are immediately necessary if a further substantial decline in the tillage area in Great Britain is to be avoided. The group concludes that either a guaranty or a subsidy would be necessary, and a scheme which combines a subsidy on all arable land with an additional subsidy on land under wheat is recommended. The restoration of the district agricultural wages boards is also favored.

The wheat crisis, J. L. Coulter (*Quart. Jour. Univ. N. Dak., 14 (1923), No. 1, pp. 3-26*).—The crisis among the wheat growers of the Northwest is said to be due to the war policy of the United States and the failure to continue emergency measures through the period of readjustment.

Certain differences between the great central winter wheat area and the Northwest spring wheat area are pointed out. The author spent a month during the harvest and threshing season in the grain belt States, and his observations are set down here. His conclusions are that the farmers of North Dakota must continue to reduce their wheat acreage, substituting corn, potatoes, pasture, alfalfa, hay, and livestock; that they must produce large yields where they do plant wheat; and that they must improve their marketing, help in the campaign to increase the consumption of wheat products, keep the poorest product at home for feed, and support any movement designed to improve the foreign market and secure beneficial legislation. The author then touches upon legislation, the war situation, and long-time policies in connection with the problem of the wheat growers of the United States.

The world's wheat in October, 1923, J. WILSON (*Liverpool: Northern Pub. Co., Ltd., 1923, pp. 29*).—Statistical notes are offered with regard to the prewar averages of yields, imports, and consumption for European and non-European countries which seemed likely to import and to export wheat in 1923, together with tabulations of yields and imports and exports for later years and ocean freights and prices.

Crown lands and land settlement, M. H. DE KOCK (In *The Results of Government Ownership in South Africa. Cape Town: Juta & Co., Ltd., 1922, pp. 119–136*).—Notes are furnished setting forth the administration of Crown lands and various land settlement schemes in South Africa and reporting the revenue therefrom.

The report of the section on colonization of the Congress of Colonial Organization (*Congrès de l'Organisation Coloniale, 1922. Compte Rendu et Rapports, vol. 2, pt. 3, Section de la Colonisation. Marseille: Commis. Gén. Exposition Coloniale, 1923, pp. 325*).—A number of papers relating to French colonization in northern Africa, Madagascar, Indo-China, and other sections are published here as presented before the section on colonization of the Congress of Colonial Organization at Marseille in 1922.

[Agricultural credit in Brazil] (*Annaes do Primeiro Congresso de Inspectores Agricolas, 1922. Rio de Janeiro: Min. Agr., Indus. e Com., 1923, pp. 258, pl. 1*).—The reports published here were presented to the Congress of Agricultural Inspectors at Rio de Janeiro in September, 1922. The advantages of societies of the Raiffeisen and Luzzatti types are set forth, and reports are submitted covering the organization and operations of the Federal district bank, organized in February, 1919, and numerous similar institutions of Brazil.

[The Land and Agricultural Bank of the Union of South Africa], M. H. DE KOCK (In *The Results of Government Ownership in South Africa. Cape Town: Juta & Co., Ltd., 1922, pp. 110–118*).—These pages of a treatise on Government ownership in the Union of South Africa present an account of the operations of the land bank instituted in October, 1912.

Rural credit and community settlement bill (*Sydney: N. S. Wales [Dept. Agr.], 1923, pp. 106, pl. 1*).—The text is given of a bill, introduced in 1922, intended to provide for community settlements and rural credit and to authorize the establishment of rural cooperative associations in New South Wales, together with numerous addresses explanatory of the bill and papers and notes relating to agricultural credit and community settlement in other countries as well as in that for which the legislation was designed.

A minimum wage for agriculture, A. C. PIGOU (In *Essays in Applied Economics. London: P. S. King & Son, Ltd., 1923, pp. 41–58*).—Reasons are advanced for a belief that a considerable number of agricultural laborers are paid less than a living wage. A discussion follows of the efficacy of a legal system of minimum wages as a remedy.

Report of the Federal Trade Commission on methods and operations of grain exporters.—I, Interrelations and profits, N. B. GASKILL ET AL. (*Washington: Govt., 1922, vol. 1, pp. XXIX+123*).—An investigation made pursuant to Senate Resolution 133, Sixty-seventh Congress, second session, is reported upon. This volume deals with the interrelations and profits of grain exporters in 1920 and 1921. Profits were ascertained for most of the large exporting companies, excepting those located on the Pacific coast and in Baltimore, and for the bulk of the export grain trade.

Some of the outstanding facts presented here are as follows: (1) The business of export concerns whose records were examined was not homogeneous, and there were marked differences in the field of operations of different companies. (2) The bulk of the grain exported from the United States is handled by a comparatively small number of firms. (3) A large proportion of it was handled in 1920 and 1921 by foreign houses with branches in this country and by American concerns wholly or partly foreign owned. (4) There were three especially important groups of domestic controlled companies engaged in the grain exporting business in 1921. (5) There is very little fixed investment in plant, almost all the funds employed being in liquid form and a large proportion borrowed.

(6) The average profits of 13 companies, whose principal business was exporting, were 58 per cent on their capital stock, surplus, and reserves in 1920 and 30 per cent in 1921 (including gains or losses on transactions in futures). The average rate of return on capital stock, surplus, and reserves excluding gains or losses on futures was almost 53 per cent in 1920, while there was a loss of over 3 per cent in 1921. (7) The companies known as fobbers selling grain for export free on board vessel at the port of shipment had somewhat smaller average profits than exporters in 1920 and higher profits in 1921, the average for 7 companies in 1920 and 8 in 1921 having been over 38 per cent in both years. (8) For individual companies the financial results of both exporters and fobbers during 1920 and 1921 varied from considerable losses to large profits.

(9) The average profit per bushel for different grains was generally larger in 1920 than in 1921 for exporters. The average for wheat, excluding gains or losses on futures, was, respectively, 8 and 0.3 cts. in the two years. The total average profit including futures was 7.7 and 2.7 cts. per bushel. On rye the exporters made an average profit of 2.7 and 0.6 cts., respectively, in 1920 and 1921, excluding gains or losses on futures. Including the latter the average profit was a little over 4 cts. on rye in the earlier year, while there was no change for 1921. An average profit per bushel on corn excluding gains or losses on futures was 1.2 cts. in 1920, but the exporters made a loss of 1.3 cts. in 1921. The average net loss including futures was 1.4 cts. per bushel in 1920, with a profit of only 0.1 ct. per bushel in 1921. (10) For fobbers the average profits on wheat did not vary as much as for the exporters and were around 5 cts. per bushel in both years, including or excluding losses or gains from futures. For rye their average profits were likewise about 25 cts. per bushel in 1921. For corn they lost on the average more heavily than the exporters in 1920, but made somewhat better transactions in 1921.

Report of the Federal Trade Commission on methods and operations of grain exporters.—II, Speculation, competition, and prices, V. MURDOCK ET AL. (*Washington: Govt., 1923, vol. 2, pp. XLI+264, pls. 13*).—This volume completes the study of the export grain business noted above. From information obtained from 12 speculators and 9 cash grain dealers who hedged their mercantile transactions and from other data, the commission concludes that while speculation frequently caused injurious breaks in wheat prices the extensive decline of the contract grade of wheat at Chicago from an average of about $2.85 per bushel on July 17, 1920, to a little over $1 on September 14, 1922, was due mainly to other factors, including supply and demand, rather than to speculation or manipulation. The advance of about 60 cts. per bushel in May, 1921, wheat futures was due to a so-called "natural corner," while the large increase of about 40 cts. per bushel in May, 1922, wheat futures during January and February, 1922, resulted chiefly from a wave of speculative buying.

An examination of the correspondence files of the more important grain exporters, merchants who sell free on board vessels at the seaports, and elevator companies showed that in the sale of grain for export there was keen competition.

The severe decline in the prices of grain in 1920 and the very low prices in 1921 were due largely to the various adverse factors in the general situation of the world market.

The evidence of this inquiry supports the fact of the inadequacy of public elevator capacity and the necessity of lower storage rates to afford the grain producer and merchant necessary marketing facilities and to prevent price manipulations.

A number of recommendations are submitted.

Marketing southern-grown sweet potatoes, G. O. GATLIN (*U. S. Dept. Agr. Bul. 1206* (*1924*), *pp. 48, figs. 20*).—A rapid increase in sweet potato production in the Southern States since 1914 is noted, being attributed largely to the movement for diversification in the Cotton Belt and the development of practical sweet potato storage houses. Storage facilities are described by sections of the sweet potato growing area.

It is estimated that of the 1920 crop 3.7 per cent of the total production in the Southern States was shipped in car lots, 19.3 per cent sold in small lots in near-by markets, 37 per cent consumed on the farms, 9.5 per cent fed to livestock, 5.5 per cent saved for seed, and 25 per cent lost from freezing, disease, and other causes. Statistics of car lot shipments by States of origin for the crop years 1919–20 to 1921–22, inclusive, are tabulated and discussed. Grading, packing, loading, and shipping methods are described in detail. Sales are said to have been generally by shipments on consignment and wire sales. These and other methods are noted. Growers and shippers are urged to adopt advertising campaigns and to organize for cooperative marketing. Federal services in marketing are set forth.

Marketing eggs, R. R. SLOCUM (*U. S. Dept. Agr., Farmers' Bul. 1378* (*1924*), *pp. II+29, figs. 16*).—Maps and tabulated statistics are given setting forth the egg production of the United States, prices, cold-storage holdings, and the number of cases of eggs received at the five principal markets from different States during 1922. Marketing and market channels are discussed, the egg structure and composition is described, and factors affecting the quality of market eggs are set forth. Directions are given for candling and grading, and commercial grades are outlined. Various types of egg packages are described and illustrated, as are also methods of packing. Finally, attention is given to shipping, preservation, and cold storage of eggs.

Farmers' Market Bulletin (*North Carolina Sta., Farmers' Market Bul., 11* (*1924*), *No. 68, pp. 8*).—The usual classified list of products which farmers have for sale is presented.

The Naval Stores Act and regulations for its enforcement (*U. S. Dept. Agr., Misc. Circ. 22* (*1924*), *pp. 8*).—The text of the act establishing grades of naval stores, preventing deception in transactions in naval stores, regulating traffic therein, and for other purposes, which was approved March 3, 1923, is published, together with the regulations for its enforcement, effective March 1, 1924.

[The agricultural products and industries of modern Brazil], W. Howarth (In *Modern Brazil. Liverpool: C. Tinling & Co., Ltd., 1923, pp. 71–93, pls. 2*).—Statistics of the production of the specific items of agricultural produce of Brazil are summarized in these pages.

Russia's agricultural concessions (*Russ. Rev., 1 (1924), No. 12, pp. 253–255*).—A number of agreements, ratified by the Russian Council of People's Commissars, making concessions of land to groups of cultivators and providing credit for agricultural operations are briefly described.

Agriculture and forestry [in Rumania] (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Spec. Agents Ser., No. 222 (1924), pp. 87–103, pls. 2, figs. 4*).—Tabulated data and notes based largely on material from the American Consulate, Bucharest, are embodied in this section of this handbook on Rumania.

An economic résumé, 1924, G. Mortara (*Prospettive Economiche, 1924. Milan: Univ. Bocconi, 1924, pp. XVI+418, figs. 42*).—This estimate of the economic and commercial resources of Italy continues the series previously noted (E. S. R., 49, p. 693).

Agricultural statistics of the State of Colorado, 1923 (*Denver: State Bd. Immig., 1924, pp. 64, figs. 24*).—Current statistics continuing the reports previously noted (E. S. R., 49, p. 392) were collected and compiled cooperatively as before.

Agricultural statistics [for Scotland], 1922, J. M. Ramsay (*Scot. Agr. Statis., 11 (1922), Nos. 1, pp. 49; 2, pp. 51–73; 3, pp. 75–102*).—These annual official statistical reports of agriculture for Scotland continue the series previously noted (E. S. R., 48, p. 793).

Rural church life in the Middle West, B. Y. Landis (*New York: George H. Doran Co., 1922, pp. XII+15–89, figs. 36*).—The two counties which were surveyed for this report in the Town and Country Series (E. S. R., 48, p. 493) are Jennings County, Ind., and Clay County, Iowa, selected as representative of large sections of the Middle West. Community life and economic and social tendencies are set forth. A composite picture is given of the religious conditions and the work of the Protestant town and country churches in these counties, illustrated with charts based upon data from Clay County. The appendixes present the methodology of the survey and the definitions employed, and include also in tabular form the major facts for each county as revealed by the investigation.

An economic survey of a rural parish, J. P. Howell (*London: Oxford Univ. Press; New York: Oxford Univ. Press, Amer. Branch, 1923, pp. 31*).—A survey was made in 1917 of a parish in England of approximately 8,000 acres, with a population of from 800 to 900 inhabitants. This report of it sets forth systems of farming, the distribution of holdings, the intensity of labor and of production, the standard of farm equipment, housing conditions, and the value of property. The appendix gives briefly the nature of the individual holdings.

A Christian program for the rural community, K. L. Butterfield (*Nashville, Tenn.: Lamar & Barton, 1923, pp. 188*).—These five chapters were delivered at the Southern Methodist University as the Fondren Lectures on Christian Missions. Prepared from the standpoint of the layman, they indicate the principles involved in a program for making country life, institutions, and group effort more acceptable. The application to rural affairs of a business, educational, social, or religious nature of fundamental Christian principles is urged. The author holds that this is a distinct and serious challenge to the American country church and its responsibility in the matter of community development.

Rural planning: The social aspects of recreation places, W. C. NASON (*U. S. Dept. Agr., Farmers' Bul. 1388 (1924), pp. II+30, figs. 19*).—The actual experiences of rural communities and rural organizations in making parks, athletic fields, and picnic grounds are related here. Rural planning and social features of certain present-day farm colonization projects are presented.

Community score card (*Washington: U. S. Bur. Ed., 1924, pp. III+31*).—This score card has been designed by the Federal Council of Citizenship Training to direct the attention of communities to important factors in their organization and maintenance. Items are arranged under the five heads of mental, health and physical, vocational, patriotic, and social and moral development. In some cases slightly different scores are offered for urban and rural communities.

AGRICULTURAL EDUCATION.

The teaching of household management in Italy, G. COSTANZO (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 4, pp. 543–556*).—The courses in household management offered at the Royal Training College for Women at Udine, the Bergamo Household Management and Domestic Science Training College, and the Milan Humanitarian Society's courses of instruction are briefly set forth. The first girls' school of farm work and household management, founded in 1902 at Niguarda in the Province of Milan, and similar institutions established at Florence in 1908 and at Atina in 1921 are described. This subject is taught also in the women's vocational schools, which are of two grades, and special steps have been taken by agricultural associations to provide such instruction. Reference is made to certain of the latter schemes.

Home demonstration work in France, O. POWELL (*Jour. Home Econ., 16 (1924), No. 4, pp. 171–176*).—The principal activities related here are the public demonstrations and exhibitions prepared by a traveling unit under the direction of the author teaching the various phases of home demonstration work, the training of two French girls on scholarships for six months in the United States, and their later work in the organization of clubs among French women and girls.

Practical animal husbandry courses [trans. title] (*Bol. Agr. Téc. y Econ. [Spain], 16 (1924), No. 182, pp. 164–170*).—Regulations and the programs of three groups of special short courses which have been noted elsewhere (E. S. R., 50, p. 599) are given here.

The preparation of a poultry judging team at Purdue University, L. H. SCHWARTZ (*Poultry Sci., 3 (1923), No. 1, pp. 22–24, fig. 1*).—The methods of training followed in an intensive course are briefly described.

Marketing poultry products, E. W. BENJAMIN (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1923, pp. VII+328, pls. 7, figs. 134*).—An introduction to this technical handbook and reference gives a brief summary of domestic and foreign production, trade, and consumption of poultry products. Chapters 1 to 11, inclusive, deal with quality of eggs; grading, packing, and shipping eggs; quality and preparation of poultry; grading, packing, and shipping poultry; preservation of eggs and poultry; distributors, their work and facilities; cooperative enterprises; prices and market reporting; the table supply; advertising and selling; and education and the Government. An extensive bibliography is included.

Handbook of the extension service of the New York State College of Agriculture at Cornell University (*Ithaca: N. Y. State Col. Agr., 1923, pp. [221], figs. 17*).—This handbook, assembled by E. A. Flansburgh, is designed to bring together reference material relating to established practices and policies in extension, forms of organization, methods of procedure, laws relating to the work, statistical data, and other matters.

Extension work in agricultural engineering, 1922, G. R. Boyd (*U. S. Dept. Agr., Dept. Circ. 270 (1924), pp. 16, figs. 12*).—The chief extension activities in rural engineering carried on in 1922 were prevention of soil erosion, the drainage of swamp and wet lands, irrigation of arid or semiarid lands, construction of better and more economical farm buildings, selection and care of farm machinery, construction of better and more convenient farm homes, and clearing of lands. Progress in teaching these various phases of the work is reported upon here.

Engineering projects are divided into two classes, the strictly technical and the nontechnical or practical. In the first class are placed those subjects, such as drainage, irrigation, power development, and architecture, which can be adequately treated only by one who has had technical education along one or more of these lines. The second class includes terracing and soil-saving dams, the care and operation of farm machinery, and the use of shop tools, all of which may be taught in a comparatively short time to large groups of people. These may well be taught by short courses, schools, or by demonstrations to groups of people. No subject should be included in this class which can not be comparatively well mastered by the average man within a short time. Such other subjects as land clearing, ditching with explosives, and home water supplies lend themselves to this method of instruction.

MISCELLANEOUS.

Biennial Report of Missouri State Fruit Experiment Station, 1921–22, F. W. Faurot (*Missouri Fruit Sta. Bien. Rpt. 1921–22, pp. [7]*).—This contains a financial statement for the biennial period ended December 31, 1922, and a report of the director of the station.

Quarterly Bulletin of the Michigan Experiment Station, edited by R. S. Shaw and E. B. Hill (*Michigan Sta. Quart. Bul., 6 (1924), No. 3, pp. 81–142, figs. 16*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Potato Varieties, by H. C. Moore; More about Robust Beans, by H. C. Rather; Fertilizing Heavy Soils in Southwestern Michigan and Fertilizing Light Soils in Southwestern Michigan, both by G. M. Grantham; Tomato Variety Tests of 1922 and 1923, by R. E. Loree; College Livestock at 1923 International, by W. E. J. Edwards; Growth of Roadside Trees, by A. K. Chittenden; Meat Inspection in Michigan Cities, by R. A. Runnells; Rotation of Chemical Elements in Agriculture, by W. Giltner and R. M. Snyder; and The Septic Tank and Tile Sewage Disposal System.

Bimonthly Bulletin of the Western Washington Station (*Western Washington Sta. Bimo. Bul., 11 (1924), No. 6, pp. 113–136*).—In addition to an article abstracted elsewhere in this issue, this number contains brief articles entitled Contagious Abortion—Prevention and Control, by J. W. Kalkus; The Clovers and Alfalfa in Western Washington, by M. E. McCollam; Contagious White Diarrhea, by W. T. Johnson; Fertilizers for Berries and Why Sweet Cherries Do Not Set Fruit, both by H. D. Locklin; Spring and Summer Spraying Programs for Western Washington, by A. Frank; Asparagus Culture; and Planting Directions for Field and Garden Crops—Spring 1924.

NOTES.

Alabama College and Station.—M. J. Funchess, acting dean and director for several months, has been appointed dean and director. Dr. F. L. Thomas, acting head of the department of zoology and entomology in the college and acting entomologist in the station, has accepted a position as head of the department of entomology in the Texas College, beginning May 1.

Arizona University and Station.—Dr. A. E. Vinson, assistant professor of agricultural chemistry and assistant agricultural chemist, has been appointed chemist in the technical service of the Haitian Department of Agriculture, now being organized at Port au Prince, of which Dr. George F. Freeman is director general.

R. B. Streets has been appointed assistant professor of plant pathology, beginning about August 1. M. F. Wharton, assistant professor of horticulture in Purdue University, has been appointed instructor in horticulture and has entered upon his duties.

Arkansas University and Station.—In addition to an increased appropriation for the general maintenance of the College of Agriculture, five special appropriations have been made for the development of the station farm, including $5,000 for five small cottages for laborers, $6,000 for installing a permanent water system, and $4,900 for tiling, fencing, and repairs.

California University and Station.—Dr. E. D. Merrill, dean of the College of Agriculture, has been appointed director of the station, beginning May 13.

Experiments in the manufacture of Roquefort cheese from goat's milk by the dairy industry division in cooperation with the Dairy Division, U. S. Department of Agriculture, are reported as very satisfactory. The experiments have included mixtures of cow's and goat's milk, as well as goat's milk alone. The quality of cheese manufactured from goat's milk or from goat's milk to which from 15 to 25 per cent of cow's milk has been added has been equal to the imported cheese. Since the temperature and moisture requirements for manufacturing this cheese are very exacting and demand the use of artificial refrigeration, it is believed that the process is adaptable only to factory conditions, where sufficient milk is available to keep at least one man fully occupied. A publication is to be prepared giving the details of manufacture.

Georgia Station.—F. R. Edwards has been appointed animal husbandman vice D. G. Sullins, resigned July 1.

Illinois University and Station.—A respiration calorimeter, said to be the third for experimentation with large animals in this country, is being installed primarily for use with steers and small horses. A novel feature is the hanging of the chamber on hoists which are lowered into an air-tight water seal.

W. A. Foster has been appointed assistant professor of rural architecture in the department of architecture of the university.

Purdue University.—G. W. Cochran has resigned to become professor of horticulture and horticulturist in the Oklahoma College and Station.

Iowa College.—Miss Ruth O'Brien, for the past seven years specialist in textile chemistry, has been appointed specialist in clothing and textiles in the Bureau of Home Economics, U. S. Department of Agriculture, beginning June 15. A new division of the bureau is being organized, major efforts for the present being directed toward obtaining facts that will help the home maker in better clothing selection and care. The effect of manufacturing processes on fibers, the simplification of garment construction, and the relation of clothing to health are among the problems that have been suggested for study.

Maryland Station.—The James Todd Laboratory for animal husbandry pathological investigations was formally dedicated and opened June 14. This laboratory is a converted serum plant and is at present investigating the efficacy of ozone in the treatment of tuberculosis.

Massachusetts College and Station.—Dean E. M. Lewis has been appointed acting president of the college, beginning August 1.

The State appropriation for maintenance of the station has been increased from $84,750 to $94,000. This is exclusive of all control work, for which $31,100 additional has been appropriated.

Robert L. Coffin, investigator in agriculture, has resigned, effective June 30. Gerald M. Gilligan has been appointed assistant chemist vice C. O. Dunbar, beginning July 1.

Michigan College and Station.—G. W. Putnam, crops specialist, has been transferred to the Upper Peninsula Substation at Chatham as director. D. L. McMillan, the former superintendent, has been appointed county agent in Chippewa County.

H. M. Wells, assistant in horticulture, has been appointed superintendent of the Graham Horticultural Substation at Grand Rapids vice H. D. Hootman, who has become extension specialist with headquarters at East Lansing. E. P. Lewis, instructor in horticulture and assistant horticulturist, has resigned and has been succeeded by J. B. Edmonds.

Missouri University and Station.—A memorial booklet has been recently issued by former students and associates of the late Dr. J. C. Whitten, for 23 years head of the department of horticulture. The booklet contains tributes to Dr. Whitten from President Emeritus J. C. Jones, Dean F. B. Mumford, T. J. Talbert, and H. F. Major.

Cornell University.—Dr. H. C. Jackson, assistant professor of dairy industry, has resigned to accept a position with the Bureau of Dairying, U. S. Department of Agriculture. F. S. Howlett has resigned as instructor in pomology to become assistant horticulturist in the Ohio Station.

New York State Station.—The 1924 legislature appropriated for the use of the station $257,790, an increase of $7,755 over the 1923–24 budget. The legislature also provided an item of $315,000 for a new horticultural laboratory building and equipment, but the item was vetoed by Governor Smith as "unessential."

Ohio State University and Station.—An exhibit of several carloads of livestock fed at the station in connection with its experimental work was made at Washington Court House June 6 in observance of livestock day. The program was in charge of the university, the station, and the Fayette Producers Company and, after a number of addresses, closed with the disposal of the steers at auction.

Oklahoma College.—The graduating class at the recent Commencement numbered 145, of whom 30 received the degree of bachelor of science in agriculture and 28 in home economics.

Pennsylvania College and Station.—W. B. Combs, associate professor of dairy husbandry and associate dairy husbandman, has resigned, effective July 15. Harold S. Newins has been appointed professor of wood utilization.

Virginia Station.—The legislature has appropriated $62,900 for the fiscal year which began March 1, 1924, and a like amount for the ensuing year. Allotment has also been made through the State department of agriculture of $9,675 and $9,655, respectively, for the two fiscal years for the support of the substations in Augusta, Henry, and Charlotte Counties. The net increase in State support for the work of the station for the new biennium is slightly over 20 per cent.

Enlarged Representation of the United States in the International Institute of Agriculture.—Under legislation included by Congress in the deficiency appropriation act, approved April 2, 1924, provision was made for an increased representation of this country in the institute through the admission of Hawaii, the Philippines, Porto Rico, and the Virgin Islands. At the seventh biennial session of the general assembly of the institute held in Rome May 2–10, a total of 19 delegates was credited to this country, the delegation including Dr. H. C. Taylor, Chief, Bureau of Agricultural Economics, U. S. Department of Agriculture; Dr. A. W. Gilbert, Commissioner of Agriculture of Massachusetts; O. E. Bradfute, President, American Farm Bureau Federation; W. H. Stevenson, Vice-director, Iowa Station; Dr. J. G. Lipman, Director, New Jersey Stations; C. W. Holman, Secretary, National Board of Farm Organizations, and National Milk Producers' Association; W. J. Robinson, President, Washington Wheat Growers' Association; B. W. Kilgore, Director, North Carolina Station; Mrs. C. B. Ware, Secretary, American Committee for the International Institute of Agriculture; Dr. Tait Butler, The Progressive Farmer; E. L. Harrison, Manager, Farmers' Union Cooperatives; Dr. E. G. Nourse, Institute of Economics; Dr. D. P. Myers, Corresponding Secretary, World Peace Foundation; L. H. Parker, World Agriculture Society; J. A. Becker and G. C. Elder, Bureau of Agricultural Economics; E. A. Foley, Agricultural Commissioner, London; Hon. M. T. Herrick, Ambassador to France; and Hon. H. P. Fletcher, Ambassador to Italy.

Additional Experiment Stations in Brazil.—A decree of April 2 authorizes the establishment in the State of Rio Grande do Sul of a central agricultural experiment station to supplant three small stations at Bagé, Alfredo Chaves, and Caxias. The new station is to have sections devoted to the culture of wheat, oats, barley, flax, sugar, and oil-bearing seeds. Another decree of the same date provides for the establishment of a similar station at Ponta Grossa in the State of Paraná to study and give practical demonstrations regarding the cultivation of wheat, rye, oats, barley, and flax.

The new stations will be located in the center of the best cereal district of Brazil, and illustrate the policy of the Government to stimulate cereal production. At the present time, wheat and wheat flour are among the most important imports, wheat production having been practicaly at a standstill for several years and negligible in quantity. Special efforts are also being made to increase the production of barley, rye, and oats.

Traveling Research Fellowships in Great Britain.—The Ministry of Agriculture and Fisheries has awarded a traveling fellowship of £250 to F. L. Engledow of the Plant Breeding Institute at Cambridge University for a visit to the United States to investigate current work in the genetics of barley, cereal yield testing, and wheat production. Other fellowships have been awarded for trips to Czechoslovakia to study hop growing and to Switzerland and Denmark to inquire into cost of production methods. A number of small grants are also available for the first time to workers in agricultural science for the payment of traveling expenses as representatives of Great Britain at international conferences and congresses.

New Journals.—The *Australian Journal of Experimental Biology and Medical Science* is being issued quarterly at the University of Adelaide for the Medical Sciences Club of South Australia. It is expected to present results of original research in pomology, biochemistry, experimental medicine and surgery, experimental pathology, experimental zoology, genetics, immunology, parasitology, pharmacology, and physiology of animals and plants. The initial number contains articles entitled The Effect of Phloridzin on the Mortality from Insulin Hypoglycemia in Mice, by A. B. Anderson; The Substitution of Taurine for Cystine in the Diet of Mice, by M. L. Mitchell; On the Mechanism of Muscular Action, by O. W. Tiegs; and The Influence of Hydrolysis upon the Capacity of Proteins to Bind Acids and Bases, by T. B. Robertson.

Zeitschrift für Tiersüchtung und Züchtungsbiologie is being published at irregular intervals as a medium for the presentation of original articles, abstracts, and other data pertaining to animal breeding and physiology and related lines. The original articles in the initial number are entitled New Information on Hair and Wool, by C. Kronacher; Photographing Domestic Animals with the Aid of the Telephoto Lens, by H. M. Kroon; The Proportions of Depth of Chest and Height of Withers in Young Friesian Steers, and A Contribution to the Study of Inheritance of Gaits, both by C. M. Van der Plank; Body Conformation and Fineness of Wool, by Schmidt; and Observations on the Morphological Inheritance and Physiological Characteristics by the Crossing of the Spotted East Friesian and Kuhländer cattle, and A Certain Form of Mountain Sickness in North America (Brisket Disease) and in the Alps, both by L. Adametz.

Agricultural Progress is being published as the journal of the Agricultural Education Association of Great Britain to meet the needs of the worker "whose special job is in the field to apply scientific principles to agricultural practice." The initial number contains a memorandum prepared by a committee of the association for the use of the Tribunal of Investigation in March, 1923, and entitled Agricultural Education and the Crisis in Agriculture. Several scientific contributions, papers presented at conferences of the association and its proceedings, book reviews, notes, etc., are included.

Landbouwkundig Tijdschrift is being published as a monthly by the Netherlands Association of Agriculturists. The initial number contains articles on International Agricultural Organizations of the Future, by E. Laur, and Pomological Investigations Undertaken in the United States, by J. C. T. Uphof, together with book reviews and abstracts.

Chemical Reviews is being published quarterly by the American Chemical Society as a medium for comprehensive analytical reviews, summaries, and short monographs on topics of interest to chemists. The initial number contains the following articles: Atomic Weights and Isotypes, by T. W. Richards; The Constitution of Polysaccharids, by J. C. Irvine; The Theory of Membrane Equilibria, by F. G. Donnan; and Organic Radicals, by M. Gomberg.

Miscellaneous.—A new research farm of 350 acres at Wrea Head, near Scarborough, has been placed at the disposal of the University of Leeds by Mrs. Ellis, widow of the Hon. John E. Ellis. The farm is being used for carrying on experiments in milk production.

J. B. Harrington has been appointed assistant professor of field husbandry at the University of Saskatchewan, beginning July 1.

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EXPERIMENT STATION RECORD.

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The death within the past few months of Drs. William J. Beal and William C. Stubbs has removed two more of the handful of survivors of the pioneer days of agricultural science in this country. Both were, of course, advanced in years, Dr. Stubbs having celebrated his seventy-seventh birthday last December and Dr. Beal being well along in his ninety-second year, and both had long since retired from active service. Dr. Stubbs' connection with the land-grant colleges covered a period from his appointment as professor of chemistry in the A. & M. College of Alabama in 1872 till his resignation as director of the Louisiana Stations in 1905. Although restricted to a single institution, the Michigan Agricultural College, Dr. Beal's services with the group were even longer, covering a full forty-year period from 1870 to 1910.

When these pioneer workers began their long career, the Morrill Act of 1862 was only just resulting in the opening of college doors to students under its provisions. Forty years later the aggregate enrollment in the four-year agricultural courses in the forty-eight States was 26,411. Their faculties, including experiment station and extension workers, numbered 6,409. The value of their permanent funds and equipment had reached a total of over $117,000,000, and their annual revenue exceeded $21,000,000.

In this remarkable development of a new system of education, which these men were privileged to observe substantially during their own days of labor, they were in no sense mere onlookers. The success which these colleges have achieved has been attained in large measure by the persistent, self-sacrificing, and assiduous toil of a relatively small group of individuals at each institution. In the case of the Massachusetts Agricultural College it was the famous Faculty of Four—Clark, Goessmann, Stockbridge, and Goodell—who are thus accredited in history. In Michigan it was a triumvirate of workers—Kedzie the chemist, Cook the zoologist and entomologist, and Beal the botanist—around whom the life of the college revolved for many years. In the South it was Dr. Stubbs, associated with Prof. J. S.

Newman in Alabama and in unchallenged leadership in Louisiana, whose indomitable energy and exceptional ability as organizer, administrator, and investigator made him an outstanding figure in the upbuilding of agricultural education and research.

The idea is sometimes expressed that in the field of education the way to influence and renown has come to be by the path of administration, and probably this is often true. Dr. Beal, however, was a notable exception to such a rule. He was primarily a teacher and a scientist—a developer and inspirer of men and an inquirer into the ways of Nature—yet his influence extended far beyond the walls of the classroom or the bounds of his own institution.

In a characteristic series of reminiscences, Dr. Beal has referred to himself as "a pioneer teacher in a pioneer agricultural college, an excellent place in which to do lots of hard work with little reward." He was in truth a pioneer.

In the field of scientific education he was among the first to use the newer methods acquired in his studies at Harvard University under Agassiz and Asa Gray. In 1881 he published his New Botany, a text which served to inspire many a young teacher of science to a broader vision.

Of his personal teaching, his son-in-law, Mr. Ray Stannard Baker, has recently written as follows:

> Among the students who passed through his classes in fifty years—and they were legion—it is doubtful whether he had more of influence as a scientist or as a man. For he had qualities of unremitting industry, sincerity of mind, simplicity of habit, together with a characteristic dry humor, which left an indelible impression upon everyone with whom, especially at the zenith of his long life, he came into contact.
>
> Not a few of his students have become distinguished botanists, horticulturists, and foresters. He was an indefatigable worker, with the habit, almost the passion, for independent observation and study. He was like a child eager to open each new package that Nature presented, to see what it contained. He rarely passed a tree or a shrub or a flower without turning to see the other side of it. He infected his students with this enthusiasm to know Nature, and to know at first hand.

Outside the classroom, Dr. Beal's tireless energy and unfailing enthusiasm found many channels of action. An entry in the chronological report of his work which he published on retirement illustrates the wide range of his efforts in the early years:

> 1877. Reported as chairman of the second orchard committee of the State Pomological Society; finished planting an arboretum of 150 species; began testing seeds that were in the market, especially those left at groceries to sell, to find many that were of very low vitality; tested seeds of red clover harvested in a very wet season; prepared the first edition of a guide to the trees and shrubs of the college campus; began a botanic garden.

As a botanist he was keenly interested in building up the various collections of the college at a time when this practice was just beginning. One of his first undertakings upon arrival was the labeling of the campus trees. In 1873 he started a grass garden and a weed garden, and in 1875 commenced a timber collection.

The arboretum, also begun in 1875, contained in a space of slightly over an acre about 150 species on Dr. Beal's retirement and the botanic garden about 2,100. The herbarium had grown under his nurture to a total of 105,688 specimens.

Another conception of his industry may be gleaned from his final report in 1910, in which he lists his contributions to journals, proceedings, and other publications, with an aggregate of 1,286 items and with a notation that this record is incomplete. Many of these were brief popular articles for the farm press of Michigan, but there are included forty-six articles credited to the Proceedings of the American Association for the Advancement of Science and nineteen to *Science*, thirty-four to the Proceedings of the Society for the Promotion of Agricultural Science, and thirty-six to the *Botanical Gazette*. There is also his well-known and elaborate monograph on the Grasses of North America, aggregating in two volumes nearly one thousand two hundred pages. In addition he prepared a general alumni catalogue of the college and subsequent to his retirement a history of the institution.

It would be expected that a personality and temperament such as Dr. Beal's would be keenly interested in research, and this was the case even in the early days when institutions for agricultural investigation were still in their infancy. He mentions a series of experiments begun in 1878, nearly a decade before the passage of the Hatch Act, on the crossing of wax beans with foreign stock, which were conducted with such care and ability as to elicit the high commendation of his former instructor, the noted botanist, Dr. Asa Gray. In the same year he instituted a comparison of thirteen kinds of fence posts, and in 1879 he commenced one of his best known pieces of work, the testing of the vitality of various weed seeds when buried in damp sand, observations on which at five-year intervals he continued for many years. He also started an eight-year study of the relation of bumblebees to the yield of red clover.

As the years went by, a considerable number of experiments were undertaken covering various phases of botany, horticulture, and forestry, with particular attention to his favorite specialties of weeds, seeds, and grasses. Upon the organization in 1888 of the Michigan Station, he was appointed botanist and one-third of his time assigned to station work. This arrangement continued for only three years, as in 1891 he was, at his own request, relieved of all station duties. During his comparatively brief station service his most important project was a study of the conditions for agriculture, horticulture, and forestry on some of the poorer lands of Michigan. Experiments were carried on in growing grasses and other forage plants on thin sandy land in five counties and reforestation trials at several points. A partial report of this work was published as a station bulletin in 1889 under the title of Experiments and Observations on the Jack-pine Plains. A number of other bulletins dealt with various Michigan seeds and weeds.

Although Dr. Beal's investigations were so largely conducted on an individual basis and he was a firm believer in the independence of the investigator, one of his greatest services was in his earnest advocacy of the promotion of science through organizations. He was one of the founders and the first president of the Society for the Promotion of Agricultural Science in 1880, the Association of Botanists of United States Experiment Stations in 1889, and the Michigan Academy of Science in 1884; secretary of the American Pomological Society from 1881 to 1885; a fellow of the American Association and vice president of its section of biology; and an active member of the Botanical Society of America and other organizations. In the meetings of these various bodies his optimism and enthusiasm, no less than his strong convictions and high ideals, made him an especially powerful influence for the advancement of agricultural science under the pioneer conditions then prevailing.

Of the many papers contributed by Dr. Beal to these societies, perhaps none is more noteworthy than his vice-presidential address before the American Association in 1885, in which he states in his opening sentence that "instead of presenting a summary of the progress made in biology during the past year, I have chosen, rather, to speak of the 'Needs and Opportunities of Agriculture,'—a subject that has heretofore scarcely been mentioned at the meetings of this association." He goes on to outline a long list of opportunities for research along biological lines, combating what he describes as the too prevalent idea of the day that "few experiments in agriculture are worth attempting unless it be those conducted by a chemist." Surprising as it may seem that such a statement should have been needed, those familiar with the development of agricultural research in this country will appreciate the aptness of his observation. In conclusion he points out that "there are many experiment stations in Europe, and some in this country. We hope their number may soon increase, and that liberal and permanent endowments will not be lacking. This association, and all other societies working in the interest of science, can render a great service by doing what they can to encourage experiments in all departments of agriculture. Men can be encouraged to prepare papers, and committees can make reports pertaining to the subject. There is a need of thorough State surveys, solely with a view to the interests of agriculture and kindred subjects. More knowledge of our soils, water, building materials, plants, timber, injurious fungi, insects, and birds would return to a State fivefold the cost of acquiring such information." This was timely counsel indeed in 1885.

The organization with which his name is most distinctively identified, however, is the Society for the Promotion of Agricultural Science. Following the appearance in the columns of the *Scientific Farmer* in 1879 of an editorial article entitled A Plea for Agricultural Science, Dr. Beal addressed a letter to the editor, Dr. E. Lewis Sturtevant, looking toward the organization of a small society with its primary object the promotion of agriculture by fostering investigations in science applied to this industry. He was one of a group of six which held a meeting at Rochester, N. Y., in 1879 to consider the matter, and of a similar group of twelve which definitely organized the new society at the Boston meeting of the American Association in 1880. He served as president for the first two years and again from 1899 to 1901, as a member of the executive committee from 1883 to 1885, and as custodian from 1896 to 1914. At all times he was among the most faithful attendants and prolific contributors.

In the meetings of the society, Dr. Beal's influence was very potent and pervasive. He saw in its formation the forging of an instrument for the upbuilding of agricultural science through the active cooperation of a relatively small but carefully chosen group of leaders and carrying with it the voice of authority. This view doubtless had much to do with the organization of the society on a limited membership basis and the adoption of the principle of selection of the fittest. As conditions changed, numerous modifications came about in the society, but his own counsel was consistently directed toward the maintenance of high ideals and a broad outlook.

In his presidential address at the second annual meeting in 1881, Dr. Beal outlined as the legitimate objects of the society the following:

> (1) To encourage the formation, cooperation, and support of agricultural experiment stations; (2) to try to ascertain what experiments in agriculture are most needed, and indicate the methods of conducting them; (3) to discover and define the best methods for uniform standards in the analyses of soils, fertilizers, and vegetable products; (4) to discover and define the best methods of stamping out parasites and contagious diseases of all domestic animals; (5) to endeavor to find the best combination of foods for growing or fattening animals in the various parts of our country; (6) to make discoveries and extend the application of science in dairying; (7) to experiment in fish culture; (8) to investigate insects which are injurious or beneficial in agriculture, and discover improved remedies for those which are injurious; (9) to learn and point out the best methods for testing each kind of agricultural seed, to ascertain its vitality and purity; (10) to make investigations in vegetable physiology, especially with reference to learning how to keep plants in healthy and productive conditions; to study fungi

which infest cultivated plants and point out remedies; (11) to advance the subject of improving crops by the selection, cultivation, crossing, and hybridizing plants for seed; (12) to encourage agricultural surveys in the States and the nation and to discover improved modes of conducting them; (13) to encourage agricultural education, to encourage and approve good work done by any one in the United States Department of Agriculture; (14) to encourage collecting and improved methods of arranging and presenting statistics in agriculture; (15) finally, in every way to encourage and help each other and others who are not members in original research in all that pertains to science in agriculture.

Assuredly, this was an ambitious program for the times and one occupying advanced ground, but it was also one which was then especially needed. It helped to crystallize men's ideas and to visualize their opportunities. To the rising generation of young men who became the organizers and leaders of the stations of the next decade, the society offered an inspiration and guidance the value of which can hardly be overestimated. It is due to Dr. Beal, perhaps more than to any other individual, that these benefits were made available in the formative days of agricultural investigation.

Retiring from active service in 1910 at the age of seventy-seven, Dr. Beal's remaining years were spent tranquilly and simply, as his son-in-law states, "in a garden of Amherst." Here he worked and played, continuing his adherence to the philosophy which he once embodied in the statement, "I studied and labored industriously because it gave me joy." Characteristically, he busied himself with a weed census of the garden. He completed his history of the Michigan College. On April 12, 1924, the end came peacefully, leaving a long record of constructive and timely service to agricultural science and education unique in the annals of this country.

While of course broadly national in influence, Dr. Beal was distinctively Northern in training and environment. Dr. Stubbs, on the other hand, was as emphatically a product of the South. He was a native of Virginia, serving with Stuart's Cavalry in the Confederate Army, and returning to his books at the conclusion of the Civil War as a graduate student at the University of Virginia. In 1869 he was appointed professor of natural science in the East Alabama College, and three years later he became professor of chemistry in the newly established land-grant college of Alabama, which was later designated the Alabama Polytechnic Institute. This position he held until 1885, resigning to begin the twenty-year service at the Louisiana State University which was terminated by his retirement in 1905. He died at his home in New Orleans July 7, 1924.

Experimental work began in Alabama in 1875, but was as elsewhere incidental to instruction duties. The operation of a ten acre branch station was undertaken in north Alabama, and the first report on the use of fertilizers in cotton growing was included in the president's report for that year. A station at the college was formally organized in 1883, with Professor Newman as director and Dr. Stubbs as chemist. The early publications of the station indicate Dr. Stubbs' active participation in the enterprise. The first five bulletins to be issued contained reports by him of variety tests of wheat carried on as acting agriculturist; a discussion of the composition and use of commercial fertilizers, which he prepared as State chemist; answers to several chemical questions in an inquiry and answer department then being conducted, evidently one of the earliest attempts at extension work; a report on cotton experiments, including the inauguration of a series of fertilizer trials subsequently continued for many years; and a discussion of phosphatic greensands.

In 1885 Dr. Stubbs was invited by a group of sugar planters of Louisiana to organize a sugar experiment station as a private enterprise. This station he located at Kenner, and later it was taken over by the State. Soon he was appointed professor of agriculture in the Louisiana State University, State chemist, and director of a contemplated series of State experiment stations. One of these stations he located in connection with the university at Baton Rouge in 1886 as the State Station. The remaining members of the group were the Sugar Station, already referred to, transferred in 1889 to Audubon Park, New Orleans, and the North Louisiana Station established at Calhoun following the passage of the Hatch Act in 1887.

As the first director of these stations, the burden of organization fell largely upon his shoulders, and it was mainly through his initiative and ability that the substantial progress which followed was attained. Regarding this phase of his work, a recent issue of *The Louisiana Planter and Sugar Manufacturer*, a journal which he helped to found and which retained him on its editorial board until his death, speaks as follows:

> As director of the experiment station he developed and improved the agriculture of the entire State of Louisiana, and his work was particularly beneficial to the sugar industry where, through his researches, he introduced improvements in every branch of this industry. * * * He introduced into Louisiana improved varieties of cane, one of which is known as D–74, which has entirely supplanted all other varieties to the marked betterment of the sugar industry, and the sugar planters of Louisiana have gained many millions of dollars in return. He established the Audubon Sugar School in 1890, and through this has trained sugar specialists who now occupy prominent positions in all large cane and beet sugar producing countries.

As this quotation indicates, Dr. Stubbs was much interested in the sugar industry, the leading branch of agriculture in the State, and he became widely known as an authority in sugar investigations. His principal scientific work was a two-volume treaties on Sugar, and he was a frequent contributor to the literature of sugar cane culture and technology. Shortly before his death he prepared an article for the 1924 Sugar Reference Book entitled Good Tilth and Drainage Essential to a Successful Cane Crop in Louisiana.

The scope of his activities, however, was much broader than any single commodity. Because of his sound judgment and initiative, as well as his knowledge of semitropical conditions, he was commissioned in 1900 by the United States Department of Agriculture to report upon agricultural conditions in Hawaii as regards experimentation, and it was upon his recommendation that the Federal experiment station was located and established at Honolulu.

He was intensely devoted to the development of Louisiana, and prepared the State agricultural exhibit as State commissioner for at least five expositions, his final service of this sort being for the Tercentennial Exposition at Jamestown in 1907. He was also greatly interested in Louisiana history, compiling numerous historical works and taking an active part in the establishment and development of the State Museum.

Dr. Stubbs' marked abilities as an investigator were greatly handicapped by the heavy burdens of administrative work and miscellaneous duties which were laid upon him. Only because of his indomitable energy and exceptional physical strength was he able to accomplish what he did in agricultural science. His scientific work was of high order and, while performed under pioneer conditions, included much that was fundamental and of permanent worth.

As a leader and inspirer of others, he was notably successful. Under his guidance a number of well-known educators and research workers were developed, and he had a wide following in the agricultural interests of Louisiana and surrounding States. His name will long be remembered as one of the great benefactors of Southern agriculture and as one of the strong forces of his day in organizing and developing agricultural research.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A new sulphur-containing amino acid isolated from the hydrolytic products of protein.—II, Sulphur excretion after ingestion, J. H. Mueller (*Jour. Biol. Chem., 58 (1923), No. 2, pp. 373–375*).—To throw more light on the nature of the new sulphur-containing amino acid previously noted (E. S. R., 49, p. 714), a study was made of the distribution of sulphur in the urine after the ingestion of from 0.5 to 1 gm. of the material. In one experiment determinations were also made by the Kjeldahl method of the total nitrogen of the urine. For purposes of comparison two similar experiments were conducted in which the sulphur compound was not included.

Following the ingestion of the sulphur compound, there was an increase in the inorganic sulphates, but not in the ethereal sulphates or neutral sulphur in the urine. There was no increase in the nitrogen excreted. These results are thought to strengthen the indirect evidence already presented tending to show that the compound may be a primary product of protein digestion.

The rates of fermentation of sugars by the propionic organism, O. E. Whittier, J. M. Sherman, and W. R. Albus (*Indus. and Engin. Chem., 16 (1924), No. 2, p. 122*).—To determine the relative rate of propionic fermentation of various sugars by *Bacterium acidi-propionici* (*d*), lactose, galactose, glucose, sucrose, and maltose in 5-gm. amounts were incubated with this organism in association with *Lactobacillus casei* at 30° C. for 16 days, under the conditions reported in a previous paper by Whittier and Sherman (E. S. R., 50, p. 205) to be the most favorable for propionic fermentation.

The relative speed of fermentation, as calculated from the grams of propionic and acetic acids produced, was greatest for maltose and least for lactose, with galactose, glucose, and sucrose giving intermediate values. It is pointed out that the relative advantage of these sugars in the commercial production of propionic acid would depend upon the relative cost and availability as well as the speed of fermentation.

The gelatinization of lignocellulose.—II, Action of dilute sodium hydroxid and cuprammonium solutions on the pentosans, A. W. Schorger (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 141–144, fig. 1*).—In this continuation of the investigation previously noted (E. S. R., 50, p. 509), the author presents evidence from the literature and from the results of certain experiments pointing to the probability that the pentosans in wood cellulose are in chemical combination with orthoglucosan (the glucose anhydrid grouping of cotton cellulose) and are not adsorbed, as suggested by Wise (E. S. R., 50. p. 206).

Comparative ash adsorption of vegetable and bone chars, P. M. Horton and P. T. Sengson (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 165–167, fig. 1; also in La. Planter, 72 (1924), No. 8, pp. 153–155*).—In this comparative study a final molasses solution of 15° Brix in varying amounts was refluxed for 1 hour with equal weights and equal volumes of bone char and Norit, after which the char was allowed to subside for 30 minutes and then filtered on an ashless filter in a Büchner funnel. The adsorbed ash was determined directly by incineration at 650 to 700° C. of the char previously washed free of adhering molasses.

The results obtained showed that, volume for volume, bone black removes more ash than Norit under the same conditions, but that, weight for weight, Norit under certain conditions is as effective as bone char. It is thought that the contradictory results reported in the literature may be due to several causes, including the ignition of the char at too high a temperature, the use of too dilute testing solution, an insufficient time of heating the solution and char, and the indiscriminate use of the volume and weight basis for comparison.

The limits of H-ion concentration as determined by electrometric titrations in water solutions of carbon dioxid, calcium sulphate, and calcium carbonate, J. W. Shipley and I. R. McHaffie (*Jour. Soc. Chem. Indus., 42 (1923), No. 30, pp. 311T–319T, figs. 6*).—Determinations by the electrometric titration method, checked by the colorimetric method, are reported of the H-ion concentration possible in water solutions in which calcium carbonate, calcium sulphate, and carbon dioxid were the variables.

The H-ion concentration of water in the presence of calcium sulphate was first measured electrometrically by titrating a saturated solution of calcium hydroxid with N/2 sulphuric acid and plotting the voltage against the volume of acid used, the voltage corresponding to the middle position on the vertical portion of the curve being taken as a measure of the H-ion concentration at the end point of the titration. The end point was found to be at a voltage corresponding to pH 7, showing that calcium sulphate is to be considered as a neutral salt.

For the next titration a steady current of carbon dioxid was bubbled through conductivity water, and voltage readings were made at regular intervals of time. The resulting curves showed a sudden drop, indicating a rapid increase in H-ion concentration as the carbon dioxid united with the water. Near the saturation point for carbon dioxid the curve gradually flattened out, and after 20 minutes the voltage readings became constant at a pH value of 3.96. Almost identical curves were obtained when carbon dioxid was bubbled into a saturated solution of calcium sulphate.

On titrating 75 cc. of N/10 sodium hydroxid with carbon dioxid in the same manner, two drops in voltage occurred, indicating the end points for Na_2CO_3 and $NaHCO_3$, respectively. These took place at the end of 30 and 60 minutes. With a saturated solution of calcium hydroxid as the base but one drop in voltage took place, indicating that no appreciable amounts of bicarbonate had been formed. Magnesium, barium, and strontium carbonates behaved like calcium carbonate, while potassium and lithium carbonates gave two drops similar to sodium hydroxid. The middle point of the curve for calcium hydroxid and carbon dioxid was at pH 9.4.

Titrations of carbon dioxid with a saturated solution of calcium carbonate and a suspension of calcium carbonate showed a more rapid drop in voltage in the case of the solution, but at the end of 15 minutes the voltage readings were practically constant.

To determine the H-ion concentration of a solution containing calcium carbonate, calcium sulphate, and carbon dioxid, an electrometric titration was made of a suspension of calcium carbonate in water with sulphuric acid, while carbon dioxid was being bubbled through. Two drops in the curve resulted, but no point could be designated as the end point for calcium bicarbonate. To determine the H-ion concentration of solutions containing calcium carbonate and sulphate, but without carbon dioxid, calcium carbonate was titrated with sulphuric acid and boiled at intervals to remove the carbon dioxid generated.

On bringing together the various curves obtained in the different titrations, the limits of H-ion concentration were found to be pH 9.38, obtained by hydrolysis of calcium carbonate, and pH 3.96, obtained in a solution saturated with carbon dioxid.

Translating these results in terms of soil acidity, the authors conclude that "water in contact with calcium carbonate in the absence of gypsum and carbon dioxid will be basic and will have a pH of 9.38. If gypsum be present the H-ion concentration will be increased and will approach the neutral point. Ground waters saturated with carbon dioxid at a partial pressure of one atmosphere in contact with soil containing limestone and gypsum will be slightly acidic, having a pH of about 5.11. Noncalcareous soils containing gypsum will be more acidic when the ground water contains dissolved carbon dioxid. If saturated with carbon dioxid at one atmosphere, the pH will be about 4.0. Ground waters in contact with soils containing neither carbonates nor gypsum will also be slightly acidic if dissolved carbon, be present.

"The effect of gypsum is to increase the H-ion concentration of ground waters when the soil contains calcareous material. If, in addition, carbon dioxid be present, the H-ion concentration may drop below the neutral point, and the soil will be slightly acidic. The H-ion concentration of calcareous soil containing gypsum is thus seen to be a function of the relative proportions of calcium carbonate and calcium sulphate present and the partial pressure of carbon dioxid in the soil gases."

Investigations in photosynthesis.—An electrometric method of determining carbon dioxid, H. A. Spoehr and J. M. McGee (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 128–130, figs. 2*).—The method described, which is based upon the absorption of carbon dioxid in an air stream by barium hydroxid and the determination of the strength of the barium hydroxid from its electrical conductivity, is said to be so delicate that the CO_2 exchange of a single excised leaf can be determined with a high degree of accuracy, limited only by the accuracy with which the resistance of the solution can be determined. A special electrolytic cell with a resistance of 6,000 ohms or more is described and illustrated. This is a pipette-shaped cell of 30-cc. capacity, having two bulbs which serve as electrode chambers. The electrodes, which are 0.25 sq. cm. in area, are placed with the flat side vertical to prevent change of resistance through the collection of air bubbles on the surface. The cell is fitted with a glass stopcock in the inlet tube and a soda lime tube fitted into the upper bulb to protect the solution from the carbon dioxid of the air.

To translate the resistance values of the barium hydroxid solution into concentration values, a curve has been constructed showing the specific resistances of a definite volume of barium hydroxid solution which had absorbed definite amounts of carbon dioxid.

The accurate determination of nitrates in soils.—Phenoldisulfonic acid method, H. J. Harper (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 180–183*).—A critical study is reported of the phenoldisulfonic acid method of determining nitrates in soils. As a result of this study, a technique for conducting the method is outlined which, if followed carefully, is said to overcome the various sources of error in the method as previously applied and to give very accurate results.

The procedure adopted is similar to that described by Bear and Salter (E. S. R., 36, p. 318) in that copper sulphate and hydroxid are used for clarifying and decolorizing the soil extract, but differs from it at this point in that the copper hydroxid is precipitated with calcium hydroxid in the cold in the soil suspension instead of with magnesium oxid and heat. It was found that floating the residue with an excess of phenoldisulfonic acid, as recommended by Davis (E. S. R., 37, p. 111), is necessary to prevent loss of nitrate when carbonates are present, but that a smaller amount of phenoldisulfonic acid is necessary than that recommended by Davis. The phenoldisulfonic acid is prepared as described by Chamot, Pratt, and Redfield (E. S. R., 26, p. 110) and the standard nitrate solution according to the directions of Bear and Salter. Ammonium hydroxid is considered preferable to potassium hydroxid for the neutralization of the phenoldisulfonic acid. The analytical procedure embodying these suggestions is described in detail.

The relationships of concentration and time to the temperature of coagulation of evaporated skim and whole milk, G. E. Holm, E. F. Deysher, and F. R. Evans (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 556–568, figs. 5*).—In this investigation the milk used was a composite sample of herd milk received daily from the U. S. D. A. Experimental Farm at Beltsville, Md. Each sample was forewarmed by heating at 95° C. on a steam bath with constant stirring for 10 minutes. The samples were then transferred to large balloon flasks and evaporated under a vacuum of 28 in. at a temperature never exceeding 50°. The evaporated products were standardized at the desired concentration, sealed in small cans, and sterilized at various temperatures for various lengths of time. In all cases the temperature was brought to 100° in 10 minutes and the additional temperature added within a period of 5 minutes. As a slight difference was found in the coagulation temperature of evaporated whole milk and evaporated skim milk at the different concentrations, allowance was made for this difference by deducting the percentage of fat in all cases and making the calculations upon the total weight minus the weight of the fat.

Between concentrations of solids-not-fat of from 16 to 26 per cent, the relationship of change of coagulation temperature to concentration was not a constant, the variation being greater at higher than at lower concentrations. The difference in temperature of coagulation for every 1 per cent difference in concentration between the limits tested was from 1.25 to 1.5°. In the region of concentration of most interest (18 to 20 per cent) the change was about 1.5°. A similar relationship between concentration and coagulation temperature was found to exist in milks of poor quality.

The relation of temperature of coagulation to the time as determined between 10 and 60 minutes was found to approximate very closely a logarithmic relation with respect to time. It thus becomes possible, if the time and temperature of coagulation of a milk of certain concentration is known, to approximate the temperature of coagulation for any other perid of time. This relationship appears to hold for milks of poorer grade.

Estimation of boric acid in cream, milk, and other foods (*Analyst, 48 (1923), No. 570, pp. 416, 417*).—A description is given of the method used in the Government laboratory (Great Britain) for the determination of boric acid in various foods. The method is a modification of the process described by Thomson (E. S. R., 7, p. 745).

The rapid analysis of sugars.—Purification and concentration of enzym solutions, F. W. Reynolds (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 169–172, figs. 2*).—A method is described for the preparation from yeast of highly active solutions of the enzyms invertase and melibiase. The general procedure consists in autolyzing the yeast, top yeast for invertase and bottom yeast for melibiase, concentrating the crude autolyzed yeast extract to a small volume by filtration through an ultrafilter, and washing the concentrated extract with an equal volume of distilled water. The extract is then removed from the funnel, diluted with four times its volume of water, treated with a little glacial acetic acid to flocculate the impurities, and the filtered solution returned to the ultrafilter and concentrated to the required volume.

The preparation of a suitable form of ultrafilter is described, with diagram, and a constant siphon arrangement for use with it in the simultaneous concentration and purification of the enzym product is described and illustrated. The technique of the method, as applied to bakers' and brewery yeast, is given in detail, and advantages in the method over other methods of preparing enzym solutions are discussed.

The true dry substance content of best molasses, R. G. Gustavson and J. A. Pierce (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 167, 168; also in La. Planter, 72 (1924), No. 8, pp. 155, 156*).—To determine the nature of the volatile material passing off from beet molasses when heated to from 100 to 105° C., as in the regular determination of the dry substance content, samples of molasses were dried in the usual manner in a constant temperature oven, but in an apparatus arranged to condense and collect the volatile matter.

Under these conditions, it was found that sulphur dioxid, carbon dioxid, ammonia, iodoform-producing substances, and an unidentified oil distilled from the molasses. The total amount of these substances, with the exception of water and oil, was 1.965 per cent of the original molasses. These results were checked by the distillation under similar conditions of pressure and temperature of a 4-gm. sample of molasses diluted with 100 cc. of neutral water. At 90°, an acid distillate giving a positive iodoform test was obtained, and at 105° an alkaline distillate testing strongly for ammonia. The undistilled residue in the flask was neutral. It is suggested that these results explain, in part at least, the variation existing between dry substance content as found by the refractometer and by the oven drying.

A special slide rule for apparent purity calculations, H. J. Bastone (*Indus. and Engin. Chem., 16 (1924), No. 2, p. 175, figs. 2*).—The slide rule described is of the 20-in. Mannheim type with two scales placed in proper logarithmic relation to each other. On the movable part of the rule is placed the polarity and purity scale, which is the ordinary A scale of the Mannheim rule with the main divisions renumbered to read from 0.8 to 100°, with subdivisions ranging from 0.01 to 0.5°. The Brix or fixed scale reads from 0.2 to 23.7°, with subdivisions of 0.1°.

An inexpensive laboratory mill, R. A. Dutcher and J. F. Laudig (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 126, 127, figs. 5*).—A description, with diagrams and photographs, is given of a simple laboratory mill suitable for grinding raisins, dried fruits, and other viscous materials in the presence of water or other solvents.

Quantitative methods for the analysis of hemicellulose in apple wood, W. E. Tottingham and F. Gerhardt (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 139, 140*).—In attempts to determine the composition of the hydrolyzable fraction of apple wood designated as hemicellulose, which has been found to occur in large amounts in the fruiting branches of apple wood (E. S. R., 47, p. 223), the following observations were made:

The extract obtained by digesting the wood in 1 per cent cold sodium hydroxid was found to have no physiological significance. Saliva proved preferable to takadiastase for removing the starch preliminary to the acid hydrolysis of the wood. Dilute sulphuric acid was found to liberate a smaller proportion of reducing substances removable by clarification than hydrochloric acid. Basic lead acetate proved an unsuitable clarifying agent on account of the excessive removal of products of acid hydrolysis with reducing power.

Determination of cellulose in wood.—Chlorination method, G. J. Ritter and L. C. Fleck (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 147, 148*).—To determine the relative efficiency of short and long chlorination periods for removing lignin from cellulose, samples of sawdust (80 to 100 mesh) from eastern hemlock, black locust, and catalpa were extracted with minimum boiling alcohol-benzene solution for four hours, washed with hot water, and dried in an alundum crucible connected to a suction pump. Duplicate samples were subjected to the long and short chlorination processes and analyzed for total cellulose, pentosans in cellulose, lignin in cellulose, and α-, β-, and γ-cellulose, in cellulose.

With eastern hemlock (heartwood) there was a 1.41 and with black locust (heartwood) a 0.91 per cent increase in cellulose by the short over the long process and with eastern hemlock (sapwood) and catalpa (sapwood) a decrease of 0.5 per cent. The pentosan content of the cellulose of eastern hemlock was slightly higher, and of black locust and catalpa lower, by the short than by the long method. The lignin content of the cellulose prepared by the two methods agreed within the limits of experimental error. The only marked difference in α-cellulose determined by the two methods was in black locust, which gave a much higher yield of α-cellulose by the short than by the long method. Beta-cellulose was considerably lower in black locust and catalpa cellulose prepared by the short method.

It is concluded that "if the amount of chlorin can be reduced in a commercial operation in the same proportion as reported in this paper, one of the objections against introducing the chlorination process for preparing pulp commercially will have been overcome."

The simultaneous production of pentosan adhesives and furfural from corncobs and oat hulls, F. B. LaForge (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 130, 131*).—In further work at the Bureau of Chemistry, U. S. D. A., on the production of adhesives and furfural from corncobs, it was found that with a temperature of 180° C. and a heating period of from 7 to 15 minutes the maximum yield of adhesive can be obtained with a yield of about 2 per cent of furfural, while if the heating period is continued for 2 hours, the time found optimum when furfural alone is to be considered, the adhesive is rapidly decomposed. The process developed for the production on a semicommercial scale of both adhesive and furfural from corncobs and oat hulls is described, and possible uses for the adhesive are suggested. Among the most promising of these uses is its application as a binder in the manufacture of anthracite coal briquets.

Oat hulls have been found to furnish a greater yield of adhesive and a smaller yield of furfural than that obtained from corncobs. Oat hull adhesive is said to be somewhat lighter in color and less hygroscopic than corncob adhesive.

METEOROLOGY.

Report of the chief of the Weather Bureau, 1923 (*U. S. Dept. Agr., Weather Bur. Rpt. 1923, pp. III+268, pls. 7*).—This report gives a summary account of the work of the Weather Bureau during the year ended June 30, 1923, and reviews the general weather conditions of the year, with the usual detailed tabulations of meteorological data. The development and benefits of the weather service are briefly reviewed.

The imminence of new discoveries in forecasting, particularly long-range forecasting, is intimated. It is held that the making of weather predictions of a general character for a considerable period of time in advance does not transcend any basic laws of nature and is not inherently impossible.

The work and publications of the agricultural meteorological service of the bureau are noted.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and H. H. SHEPARD (*Massachusetts Sta. Met. Buls. 423–424 (1924), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during March and April, 1924, are presented. The data are briefly discussed in general notes on the weather of each month.

Meteorological tables, D. A. SEELEY (*Mich. State Bd. Agr., Ann. Rpt. Sec., 61 (1922), pp. 135–148*).—Daily and monthly summaries of temperature (maximum, minimum, and mean), precipitation, cloudiness, and sunshine, and monthly summaries of pressure (maximum, minimum, and mean), wind movement, and miscellaneous phenomena (frost, hail, thunderstorms, fog, auroras, and halos) at East Lansing, Mich., are given for the year ended June 30, 1922.

Weather conditions, C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 9–11*).—Observations at the Crookston substation on temperature, precipitation, cloudiness, and wind, 1920–1922, and killing frosts, 1897–1922, are tabulated and briefly discussed. The mean temperature for 1922 was 40.9° F., as compared with the 10-year average of 38.98°. The annual precipitation was 26.4 in., as compared with the 10-year average of 18.4 in. The frost-free period extended from April 27 to October 8, as compared with the 26-year average of May 18 to September 23.

Weather of the season, P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1922, pp. 8–11*).—Observations on temperature, precipitation, and cloudiness for 1922 and preceding years are recorded in tables. The season of 1922 was a dry one, the total precipitation for the year being 20.88 in., as compared with a 14-year average of 25.57 in. As a result crops were greatly reduced in yield and were in many cases total failures on sandy soils. On the heavier types of soil, however, very satisfactory yields of corn and small grains were obtained.

[Weather observations at Scottsbluff, Nebr., Experiment Farm], J. A. HOLDEN (*U. S. Dept. Agr., Dept. Circ. 289 (1924), pp. 1–3*).—Observations on temperature, precipitation, evaporation, wind, and frost-free period during 1920 and 1921 are recorded in tables and briefly commented upon and compared with the means for the 11-year period 1911–1921. The total precipitation in 1920 was 16.86 in. and in 1921 12.58 in., as compared with the 11-year mean of 14.6 in. The frost-free period was 141 days in 1920 and 139 days in 1921.

Meteorological report for 1922, F. E. HEPNER (*Wyoming Sta. Rpt. 1923, pp. 71–74*).—A summary is given of observations at the University of Wyoming, Laramie, on pressure, temperature, precipitation, wind, and cloudiness. The mean pressure for the year was 23.053 in. The mean monthly temperature was 41.7° E., only 1° above the normal. The maximum temperature was 88° July 14, the minimum −28° January 19. The last killing frost in spring occurred June 2, the first in autumn October 7. The total precipitation was 10.02 in., 0.7 in. below the normal. Although the precipitation was nearly normal for the year as a whole, it was subnormal in May, June, and July, and crops suffered in consequence.

The geographical distribution of snow [trans. title], G. FERRARA (*Met. Prat. [Osserv. Montecassino, Italy], 4 (1923), No. 2, pp. 63–68, pl. 1; rev. in Nature [London], 113 (1924), No. 2832, p. 210*).—Snowfall data are given in detail and mapped for Italy, with more general references to snowfall conditions in other regions of the world. Conditions controlling the fall and accumulation of snow are discussed.

SOILS—FERTILIZERS.

Soil management, F. E. Bear (*New York: John Wiley & Sons, Inc., 1924, pp. VI+268, pl. 1, figs. 32*).—This book is one of the Wiley Agricultural Series, edited by J. G. Lipman. Its purpose is to give information on the applications of those scientific facts and principles which are of use in planning constructive systems of soil management and increasing the productive capacity of soils. The data upon which this work is based were selected largely from those published from time to time by the Ohio Experiment Station. Sections are included on requirements of crops, characteristics of soils, and utilizing, conserving, and supplementing soil resources.

Studies and researches on soil reaction [trans. title], U. Pratolongo (*Ann. Ist. Agr.* [*Milan*], *16* (*1920–21—1921–22*), *pp. 1–128, fig. 1*).—This is an extensive review of most of the existing facts, theories, and opinions relating to soil reaction and its influence on soil characteristics and processes and on plant growth, characterstics, and prosperity. It contains chapters on soil reaction, acid, and alkaline constituents of soil, different aspects of soil acidity and alkalinity, origin of soil acidity and alkalinity, influence of culture on soil reaction, regulation of soil reaction influence of origin on reaction, determination of soil reaction, relation between soil reaction and vegetation, soil acidity, and distribution of acid and alkaline soils in Italy.

A bibliography of 199 references is included.

Reaction of Italian soils, with special reference to those of Lombardy [trans. title], U. Pratolongo (*Ann. Ist. Agr.* [*Milan*], *16* (*1920–21—1921–22*), *pp. 129–191*).—The results of mechanical, physical, and chemical analyses, including pH value and reaction determinations, of 501 samples of soils from the different Italian provinces are reported and discussed. Data on the origin, vegetation, and state of cultivation of the soils are also included.

The results indicate that reaction is a dominant factor in the chemical fertility of these soils. The more fertile soils had values for specific acidity varying from 6.6 to 7.8. The nitrogen content of these soils varied markedly without influencing the essential character of the fertility, however. Similar variations were found with reference to total phosphoric acid, which were also totally independent of the state of chemical fertility of the soil.

Such variations in content of nutritive constituents had an influence on soil fertility as the values of the specific acidities of the soils descended to between 4 and 5. This was especially true with reference to nitrogen in such soils as peat. Soils originating from acid rocks were usually either neutral or slightly acid but grew more acid with age.

A bibliography of 29 references is included.

A study of the tolerance of plants to acid conditions as determined by the hydrogen-ion concentration, L. W. Tarr (*Delaware Sta. Bul. 135* (*1924*), *pp. 17, 18*).—Data from the second part of preliminary observations (E. S. R., 48, p. 26) are summarized, indicating that soils differ materially in their resistance to change in reaction upon the addition of acids and alkalis.

Experiments with sand, clay loam, and muck showed that the sand soil exerted little buffer effect when treated with acid. Both the clay loam and the muck, however, exerted considerable buffer effect. Similar results were observed when these soils were treated with alkali. The sandy soil was quickly brought to a neutral condition, while the clay loam soil changed gradually toward the neutral. The muck resisted an appreciable change toward neutrality even upon the addition of relatively large amounts of alkali.

Gels and theory of adsorption, N. E. Gordon (*Science, 58* (*1923*), *No. 1511, pp. 495–497, fig. 1*).—A summary of some of the results obtained in studies during the past three years at the University of Maryland on adsorption phenomena, particularly those occurring in soils and clays, is presented (E. S. R., 48, p. 214; 49, p. 17).

The results indicate that there are four different types of adsorption from solution, namely, chemical adsorption which follows the mass law, exchange adsorption where one ion is adsorbed at the expense of replacing an equivalent amount of a second ion, partition ratio adsorption where the adsorption obeys Henry's law, and electronic adsorption where the adsorbed material seems to be held by a secondary valence. There is also what might be called a fifth type, which is a combination of two or more of these types.

Some physical and chemical properties of several soil profiles, L. C. Wheeting (*Michigan Sta. Tech. Bul. 62 (1924), pp. 3–31, figs. 6*).—Laboratory information concerning the profiles of several Michigan soils are presented and discussed. This is based upon two lines of investigation embodying (1) physical measurements of mechanical composition, hygroscopicity, heat of wetting, free and unfree water, and freezing point determinations, and (2) chemical analyses and reactions.

The physical measurements, with the exception of the freezing point determination, showed the profiles of Miami loam and silt loam, Bellefontaine loam and sandy loam, and Fox loam to be quite similar in constitution, and indicated the existence of eluviation processes. Freezing point measurements indicated the influence of organic matter on the solubility of soil minerals. The surface soils, on standing, yielded large amounts of material to the soil solution, while the subsoil and other lower lying horizons yielded relatively small quantities of material. Chemical determinations were found to be excellent criteria by means of which weathering processes may be measured.

Silicon, aluminum, and iron were found to be persistent minerals highly resistant to the ordinary weathering processes. The solution, translocation, and subsequent precipitation of the iron and aluminum in the first five profiles of soil are considered to be a proof of acid weathering processes. Calcium carbonate appeared to be the most readily reached soil mineral. Potassium salts seemed to be quite resistant to weathering processes.

Phosphorus was found to exist throughout the soil profiles in variable quantities, some soils being richer in this element in one of the lower lying horizons and others being richer in the surface horizon. Sulphur varied but slightly in the horizons of any profile and was present in relatively small quantities. Nitrogen and organic carbon existed mainly in the surface horizons in the presence of organic matter. Carbon as carbonates was distributed in exactly the reverse order from its organic form, the most abundant supply being in the unweathered drift. According to the H-ion determinations the profiles of Miami loam and silt loam and Bellefontaine sandy loam are alkaline in reaction.

Soil survey of Iowa—Johnson County, W. H. Stevenson, P. E. Brown, et al. (*Iowa Sta. Soil Survey Rpt. 32 (1923), pp. 72, pls. 2, figs. 15*).—This survey deals with the soils of an area of 390,400 acres lying in the Mississippi loess and Iowan drift soil areas in eastern central Iowa. The topographic features of the county are those of an eroded broad smooth plain. The drainage system is said to be quite adequate, although there are some areas where tiling would be of value.

The soils of the county are grouped as drift, loess, terrace, and swamp and bottomland, of which the loess covers 71.9 per cent of the area. Including meadow, muck, and riverwash, 28 soil types of 15 series are mapped, of which the Clinton and Tama silt loam loess soils cover 45.9 and 18.9 per cent of the area, respectively.

Data from laboratory, field, and greenhouse studies of the fertility requirements and crop adaptations of the prevailing soil types are presented and discussed. These indicate that all the soils of the county are acid in reaction and are generally deficient in phosphorous. The need for organic matter and nitrogen is not pronounced in the case of all the soils. Data on methods used in soil surveys in the State are appended.

Representative Transvaal soils.—VI, Sandy soils and sandy loams on the older granite, B. de C. Marchand (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 1, pp. 16–21*).—In a sixth contribution to the subject (E. S. R., 50, p. 815), data are presented on the mechanical and chemical characteristics of large areas of a coarse-grained sandy soil passing into a sandy loam, occurring in northern, northeastern, and eastern Transvaal. These soils are gray, yellowish gray, or brown in color, and the depth varies from a few inches to from 2 to 3 ft., with sometimes an unusual depth of 30 ft. The subsoil is similar to the surface soil, but where the latter is brown the former may be red. The texture is coarse and gritty.

The mechanical analyses show that the soil is composed largely of fine gravel and sand, ranging in size from 0.2 to 3 mm., and is remarkably free from very coarse materials. The chief physical defect of these soils is said to be their open porous nature, which makes them subject to drought. On the other hand, the run-off from these light soils is much smaller than is the case with heavy soils.

The chemical analyses show that the soil is deficient in reserve and available phosphates, organic matter, and nitrogen, and is only moderately well supplied with potash.

Chemical aspects of some north Auckland soils, W. A. Given (*New Zeal. Jour. Sci. and Technol., 5 (1922), No. 4, pp. 192–196*).—Chemical analyses of representative samples of some of the soils of north Auckland are summarized and briefly discussed. These soils are derived from sedimentary and igneous rocks and include in addition alluvium and sand dunes.

Soil productivity and the distribution of population in north Auckland, H. T. Ferrar (*New Zealand Jour. Sci. and Technol., 5 (1922), No. 4, pp. 187–191*).—Data are presented from which the conclusion is drawn that the distribution of the rural population in north Auckland is governed by the productivity of the different soils. With one exception the underlying rock formations give rise to distinct soil formations, which differ only as regards origin, texture, and composition.

[Soil bacteriological studies at the Michigan Station], R. H. Snyder (*Michigan Sta. Rpt. 1922, p. 185*).—In studies of so-called nitrobacter soil vaccine on two different types of soil growing both legumes and nonlegumes, the treated soils failed to respond more favorably than the untreated and gave no better yields.

Studies on the bacterial decomposition of peat showed that the amount of plant nutrients rendered soluble in peat bears a close relation to that removed by the crop and drainage water together.

[Soil studies at the Washington Station], F. J. Sievers (*Washington Col. Sta. Bul. 180 (1923), pp. 49–55*).—Studies of the rate and kind of decomposition of such crop residues as straw and alfalfa in soils of low and high nitrogen and organic matter contents, to determine the underlying principles of organic matter decomposition and maintenance in soils, showed that the decomposition of organic matter in soils that have received no organic matter except what is returned as stubble is in direct proportion to the organic matter in the soil. The kind and rate of decomposition of straw and alfalfa were very different. Straw with a nitrogen content of about 0.5 per cent decomposed at a very uniform rate throughout the average growing season, while alfalfa with a nitrogen content of about 2.5 per cent decomposed very rapidly during the initial period of 16 days and then dropped below straw, finally ending up with a lower total carbon loss than straw. This is taken to indicate that organic matter maintenance in soil depends on the nitrogen content of the residues. From the standpoint of crop yield the straw acted detrimentally in inhibiting nitrate content. The biological activity of the soils of eastern Washington decreased directly with the loss of organic matter and nitrogen. Virgin soils showed the greatest activity.

Studies to determine the effect of variations in tillage and cropping on the total nitrogen supply in the soil from manured and unmanured plats led to the conclusion that plats appearing quite uniform may show large variations in nitrogen content in individual samples, which are more pronounced for manured plats. The probable error for a manured plat was 0.88 per cent, while that for a summer fallowed plat was 0.335 per cent. It is further concluded that on plats ranging in area from $\frac{1}{40}$ to $\frac{1}{20}$ acre, where extreme accuracy is required and where the limit of error has been determined by the analysis of a large number of individual samples, a composite sample should be composed of at least 25 individual samples before any conclusive results can be obtained bearing on small nitrogen losses or increases.

The soil fertility problems in eastern and western Washington are discussed.

[**Soil studies at the Michigan Station**], M. M. McCool (*Michigan Sta. Rpt. 1922, pp. 232–239*).—Data on cooperative fertilizer projects, with special reference to the fertility requirements of muck soils, are presented and discussed. Other soil problems are briefly enumerated.

Soil fertility and soil management experiments, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 41–57, figs. 3*).—Considerable data on the continuous cropping of small grains without fertilization; a 4-year rotation without manure, fertilizer, or legume; a complete fertilizer experiment; and a phosphate and manure experiment are presented and briefly discussed, no conclusions being drawn.

Studies begun in 1921 on the effect of treble superphosphate on alfalfa showed no distinct effect of the phosphate in the first season. The effect was very marked in the second season, and the yield of hay from two cuttings was more than twice as heavy on treated soils as on untreated soils. Gypsum had no apparent effect.

Data from a rate-of-manuring experiment in which 4, 8, 16, and 32 tons of manure per acre were used in a 4-year rotation of corn and potatoes, wheat, clover, and oats showed that the largest increases per ton of manure were obtained from the 4-ton application. Manure spread over a large area at this rate was more profitable than large amounts spread over a small area so far as wheat, corn, and oats were concerned.

Data on the value of straw as a fertilizer on wheat, corn, and potatoes showed slight increases in the case of wheat.

[**Fertilizer experiments at the Morris Substation**], P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1922, pp. 11–27, figs. 2*).—Data on phosphate and manuring rotations and on the use of acid phosphate on wheat, oats, corn, and clover are reported.

During the last 2 years of an 8-year period acid phosphate combined with manure produced the largest yields of wheat, while during the entire 8-year period there was only a fraction of a bushel advantage in favor of the combination. The combination gave the best returns in dry seasons, while in seasons with normal rainfall acid phosphate alone gave the best results from the standpoints of both yield and quality.

The results of 7 years' experiments showed substantial increases in the yield of oats, with acid phosphate, especially in seasons of short rainfall. Seven years' experiments with corn showed the highest yields with acid phosphate and manure, although the average for the 7 years with rock phosphate and manure was almost as high. Throughout the period, manure alone was slightly more efficient than acid phosphate alone, while with rock phosphate alone the yields increased only slightly. Eight years' results with clover showed almost as good results with rock phosphate as with acid phosphate. Manure in combination with phosphate fertilizers was more effective than either fertilizer alone.

Fertilizer tests with alfalfa, including the use of lime, gypsum, acid phosphate, potassium sulphate, rock phosphate, and barnyard manure alone and in different combinations, showed that the increases due to the use of fertilizers were too small to warrant their use with alfalfa, with the exception of acid phosphate and manure.

The results of 7 years of rate-of-manuring experiments on a rotation of corn, wheat, barley, and clover with applications of manure varying from 0 to 32 tons per acre showed that the 8-ton application was the most effective with corn, while with the wheat the yields were proportionately increased as the amount of fertilizer was increased, with the exception of the 16 and 32 ton treatments. Barley was also benefited in direct proportion to the amount of fertilizer applied. Clover was benefited most by the heavier applications. The results are taken to indicate that 8 tons of manure per acre is perhaps the most effective rate of application as a basis of profit per acre.

Seven years' experiments on the fertilizing value of wheat straw and corn stover on a 2-year rotation of wheat and corn when used at rates of 1 and 2 tons per acre showed some beneficial effect on both crops on soils receiving 2 tons of stover and 1 ton of straw.

Data on cooperative phosphate experiments in 1922 are also included.

Manures and fertilizers, R. Heinrich and O. Nolte (*Dünger und Düngen. Berlin: Paul Parey, 1922, 8, ed., rev., pp. VIII+174*).—This is the eighth revised edition of this book (E. S. R., 41, p. 626).

The effect of lime and manure on Vernon and Kirkland soil as measured by plant characteristics, H. F. Murphy (*Jour. Amer. Soc. Agron., 15 (1923), No. 11, pp. 442–444*).—In a contribution from the Oklahoma Agricultural and Mechanical College, the results of experiments on the effect of lime and manure on the yield of crops on Vernon and Kirkland soils are briefly reported. These indicate the favorable influence of lime and manure on these soils.

Conservation of liquid manure with acid ammonium sulphate [trans. title], H. Wiessmann (*Ztschr. Pflanzenernähr. u. Düngung, 2 (1923), No. 7, Wirtschaft.-Prakt., pp. 356–358*).—Tests of the value of acid ammonium sulphate as a preservative for liquid manure are briefly reported. The acid ammonium sulphate used contained the same amount of sulphuric acid but less nitrogen than ammonium sulphate. It was found that the ammonia lost from liquid manure was almost wholly combined as ammonium sulphate when acid ammonium sulphate was used as the preservative. Further study into the economic aspects of this process is recommended.

Investigation on the action of ammonium bicarbonate in comparison with ammonium sulphate and sodium nitrate in different methods of application [trans. title], O. Lemmermann and K. Eckl (*Ztschr. Pflanzenernähr. u. Düngung, 2 (1923), No. 2, Wirtschaft.-Prakt., pp. 98–109*).—Experiments to compare ammonium bicarbonate as a fertilizer on loamy sand soil with ammonium sulphate and sodium nitrate and to determine the influence of different methods of application on its action are reported.

The results showed that surface application of ammonium bicarbonate to potatoes before planting did not give as good results as when sodium nitrate or ammonium sulphate was used in the same manner. Apparently surface applications of ammonium bicarbonate resulted in nitrogen losses. Top-dressings of ammonium sulphate were also less effective than when this material was incorporated in the soil before planting.

The use of ammonium bicarbonate on this soil in surface applications before the planting of root crops usually resulted in important losses of nitrogen by evaporation. Such losses were not so apparent when this material was used on grain. It is not considered desirable, however, to use ammonium bicarbonate under any circumstances as a top-dressing.

The action of physiologically acid and alkaline nitrogen salts [trans. title], F. MÜNTER (*Ztschr. Pflanzenernähr. u. Düngung, 2 (1923), No. 11, Wirtschaft.-Prakt., pp. 497–516*).—Studies are reported which showed that physiologically acid salts added in large quantities to wheat in sand soils had a more favorable influence on the yield and phosphoric acid assimilation than physiologically alkaline salts, as long as the soil remained alkaline in reaction. Smaller additions of physiologically opposite reacting nitrogen salts on soils of less alkalinity decreased the action on plant growth and phosphoric acid assimilation. Where the soil contained little calcium carbonate and was only slightly alkaline, ammonium sulphate had an injurious effect.

Where large quantities of alkali resulted from nitrate fertilization, plant growth was injured and phosphoric acid assimilation was retarded. Fertilization with nitrate and lime was able to prevent completely yield increases or phosphoric acid assimilation from tribasic lime phosphates. While, in general, wheat was little injured, flax was very sensitive to high alkalinity in these tests. The latter, however, showed a good growth after fertilization with physiologically acid nitrogen salts.

It is concluded that differences in soil alkalinity become evident after vegetation tests in sand soils only when very large quantities of physiologically acid or alkaline nitrogenous fertilizers are used.

Potash in the greensands of New Jersey, G. R. MANSFIELD (*U. S. Geol. Survey Bul. 727 (1922), pp. VIII+146, pls. 10, figs. 6*).—The results of an investigation of the potash-bearing greensands of New Jersey, made by the U. S. Geological Survey in cooperation with the Department of Conservation and Development of the State of New Jersey, are presented.

It is stated that the greensand marl belt of New Jersey extends across the State from the vicinity of Sandy Hook at the northeast to the Delaware River near Salem at the southwest, a distance of about 100 miles. The potash in the greensand marl occurs chiefly in the mineral glauconite, which is essentially a hydrous silicate of ferric iron and potassium. It is conservatively estimated that the New Jersey greensands contain 256,953,000 short tons of potassium oxid which could be mined by open-pit methods. At the rate of importation for the five years preceding the World War, including 1914, this quantity could supply the needs of the United States for nearly 1,000 years. The lime sand in probable commercial thickness is exposed or has been recognized in wells as far north as Wrightstown.

A review of recent experiments is given, indicating that the potash in greensand is promptly available to meet the needs of many and perhaps most farm crops. The results of separations and determinations from composite samples, prepared to represent the principal beds of commercial thickness at each of the localities drilled, are discussed both in their relation to the recovery of potash from greensand and in their bearing on the origin of glauconite.

It is stated that four companies have undertaken to produce or utilize the potash from New Jersey greensand, but that while small quantities of potash have been produced and marketed none of these companies is now producing.

The recovery of potash as a by-product in the blast-furnace industry, A. R. Merz and W. H. Ross (*U. S. Dept. Agr. Bul. 1226* (*1924*), *pp. 22*).—Studies to determine the amount of potash that is annually charged into the blast furnaces of the country are reported. Representative samples of the raw materials including iron ores, fuels, and fluxes that are consumed in the blast furnace industry were obtained and analyzed with reference to their potash content.

The weighted average of the potash in the ores, coke, and limestone used in the blast furnace industry was found to amount to approximately 0.2 per cent for each material, which is less than one-third as great as that found for the raw mix used in the cement industry. In the case of the ores, the potash ranged from 0.04 per cent for Mesaba ores to over 2 per cent for certain foreign ores. As the consumption of high-potash ores is relatively small as compared with low-potash ores, the weighted average of the potash in the ores consumed is less than the mean average found for different ore samples.

The total potash in the ore, coke, and limestone used in blast furnaces was found to amount to 7.3, 4.1, and 1.7 lbs. per ton of pig iron, respectively, or to a total of 13.1 lbs. The potash in the slag amounts to 8.2 lbs., which leaves a balance for the volatilized potash of 4.9 lbs. per ton of pig iron. This amounts to a total for all plants of about 84,000 tons annually, as compared with 87,000 tons for the cement industry. As there are twice as many blast furnaces as cement plants in the United States, the quantity of potash lost per individual plant must therefore be less in the blast-furnace industry than in the cement industry, but it is possible that the dust from some blast furnaces in which manganiferous ores are used may be richer than the richest cement dust.

A bibliography is included.

Lime and phosphates, G. L. Schuster (*Delaware Sta. Bul. 135* (*1924*), *p. 6*).—Studies on the effect of different degrees of fineness of limestone on the decomposition of organic matter in the soil are said to have shown that 60- and 100-mesh limestone materials are fully as effective as calcium oxid in promoting decomposition of organic matter. The 100-mesh limestone and calcium oxid produced quite similar results and showed the most favorable effects upon the activity of soil organisms. No appreciable difference in the effect upon the availability of soil phosphorus or soil potassium was shown by the different lime materials.

Lime requirement survey, G. L. Schuster (*Delaware Sta. Bul. 135* (*1924*), *pp. 7, 8*).—Tabular data on the lime requirement of different Delaware soils are presented.

Studies upon the lime requirement of New Hampshire soils (*New Hampshire Sta. Bul. 212* (*1924*), *pp. 34, 35*).—Continuing work previously noted (E. S. R., 49, p. 323), tabular data summarizing the results of lime requirement determinations by H. R. Kraybill and C. P. Spaeth of about 309 samples of New Hampshire soils are presented.

Sulphur as a plant food, J. L. St. John (*Washington Col. Sta. Bul. 180* (*1923*), *pp. 18, 19*).—Continuous cropping to alfalfa under greenhouse conditions is said to have shown that increases in yield obtained from an initial application of sulphur and gypsum were not maintained. A second application of sulphur as a top-dressing caused a renewed increase in growth in certain cases. Ammonium sulphate, sulphur, and sodium nitrate seemed to have little effect, with a tendency toward a decrease, on the rate of oxidation of straw in one soil. Large applications of sulphur increased the amount of potassium obtained by percolation and extraction. Colorimetric determinations of H-ion concentration indicated that large applications of sulphur increased the concentration of H-ions from about the neutral point to about pH 4. Sulphur applications were found to increase the nitrogen content of the first cutting of clover and alfalfa, but that in the second and third cuttings was little affected. There was also little effect on the percentage of total ash or calcium in alfalfa.

A study of the effect of inoculated and uninoculated sulphur and gypsum on the fertility of silt loam soil of the Palouse region, as indicated by the composition of leachings from the soils variously treated, indicated that more of the gypsum than of the sulphur may be lost in the drainage water during the rainy season. The treatment did not seem to affect the loss of phosphorus. Gypsum caused an increased loss of potassium.

Sulphur prevents loss of nitrogen in compost (*Georgia Sta. Rpt. 1923, p. 43*).—It is said to have been found in laboratory studies that sulphur prevents the loss of nitrogen as ammonia from compost heaps, aids ammonification, prevents the formation of free nitrogen, and apparently prevents nitrification.

The action of neutralization sludge obtained from sulphite waste liquor and lime on plant production [trans. title], E. Blanck, W. Geilmann, and F. Alten (*Ztschr. Pflanzenernähr. u. Düngung, 2 (1923), No. 9–10, Wirtschaft.-Prakt., pp. 433–445*).—Studies are reported which showed that the neutralization sludge from lime and sulphite waste liquor of the cellulose industry did not decrease the yield of mustard, which is usually quite sensitive to sulphite salts. The transformation to sulphate of the sulphite contained in this material took place very slowly in the air but very rapidly in the soil under the influence of bacterial activity.

[Michigan fertilizer inspection report, spring 1923], L. W. Watkins and W. C. Geagley (*Mich. Dept. Agr. Bul. 22 (1923), pp. 29*).—The results of actual analyses and guaranties of 415 samples of fertilizers and fertilizer materials collected for inspection in Michigan during the spring of 1923 are presented, together with the text of the Michigan fertilizer instruction law and a list of fertilizer manufacturers and brands of fertilizer licensed.

A summary of the inspection results shows that 25.3 per cent of the total number of samples tested were below the guaranties in one or more elements. Of these, only about one-half were below the guaranties in commercial value, indicating poor mixing at the factory.

AGRICULTURAL BOTANY.

Report of the department of plant physiology, E. M. R. Lamkey (*Delaware Sta. Bul. 135 (1924), p. 48*).—In continuation of previous reports (E. S. R., 48, p. 623), the author briefly summarizes the results of his investigations for the year. From a study of the changing permeability of the peach and its relation to availability, the author claims that permeability reactions constitute the most trustworthy standard for the measurement of the plant response to soil fertilizers.

Investigations on the reaction of enzyms to solutions within the peach plant are said to confirm previous results, and rather complete data have been secured upon the enzyms active in the transformation of starch, dextrin, maltose, saccharose, tannin, amygdalin, and proteins, as well as upon the activity of enzyms of an oxidizing nature.

Experiments with close-bred types of corn, in which enzymatic activity is considered as a limiting factor in production, have been continued, and several typical strains of corn have been isolated for further study.

[Report on plant physiological investigations], R. P. Hibbard (*Michigan Sta. Rpt. 1922, pp. 207, 208*).—A brief account is given of studies of pure lines of wheat grown in various culture solutions, the experiments being conducted in the greenhouse during the winter and repeated in the spring. It is claimed that climatic conditions played an important part in determining the distribution of good and poor growth in the different solutions. Variability in plants was frequently found to obscure any relation that may hold between the physiological values of the different solutions tested. It is believed that this difficulty could be overcome partly by using pure line seed, improved methods of germination, and selection of original seedlings which should be employed in large numbers in the experiments.

As a result of the author's investigations thus far conducted, he believes it is impracticable for a single worker to secure results involving all the influential conditions in a known way.

Optimum temperatures for flower seed germination, G. T. Harrington (*Bot. Gaz., 72 (1921), No. 6, pp. 337–358, figs. 10*).—During the spring of 1912. preliminary work was done on the temperature conditions best suited for the germination of a few of the more common flower seeds. During the winter and spring of 1913–14, further work was done with the same species and a few others. The publication of the results has been unavoidably delayed, but meanwhile the recommendations included in this report have been followed with good results.

The method and apparatus are described, also the results are considered from three standpoints, namely, the effect of alternating v. constant temperatures, the effect of the different temperatures upon the germinating capacity, and the effect of the different temperatures upon the rapidity of germination.

It appears from the facts presented that the use of warm temperatures usually increases the rapidity of germination of the species investigated, but that comparatively low temperatures are more favorable for completeness of germination. In conducting germination tests of each species, a temperature should be used which is high enough to accelerate the progress of germination as much as can be done with safety. At the same time, it should not be warm enough to prevent the germination of any viable seeds, or to encourage unnecessarily the development of microorganisms.

The substratum should be such as to furnish abundant water to the germinating seeds without limiting the oxygen supply. For this purpose folded blotting paper well moistened with water is favorable. The seeds should also be spaced so as not to touch.

The conditions are indicated, in tabular form, which are recommended for use in making germination tests of the kinds of flower seeds included in the investigation, as are also the numbers of days necessary for a preliminary estimate of the germinating capacity and for complete germination. It is emphasized that more uniformly good results can probably be obtained by using for each species the temperature so indicated.

Plant metabolism studies. (*New Hampshire Sta. Bul. 212 (1924), pp. 7–9*).—A report is given of studies by H. R. Kraybill and T. O. Smith of the effect of modifying the supply of nitrogen, phosphorus, and sulphur upon growth and fruit production of tomato plants. Where plants were started in a fertile soil and then transplanted to sand with a nutrient solution lacking in phosphorus, feeble growth of deep green color was made, but the plants did not produce fruit. When grown in sand lacking nitrogen the plants also grew poorly and did not bear fruit, but they had a pale green color. Plants grown in sand with nutrient solutions lacking in sulphur were slightly less vegetative and fruitful than those grown in complete nutrient solutions, and were slightly higher in total nitrogen, free reducing substances, and total carbohydrates, but the effect of leaving out sulphur in the solution was not very marked.

Compared with plants grown in the complete nutrient solution, those grown in solutions lacking in phosphorus were much lower in insoluble nitrogen, higher in soluble nitrogen, and slightly higher in lipoid nitrogen. When grown in solutions lacking nitrogen, the plants made very poor growth. When grown in solutions lacking phosphorus similar growth effects were noted, but the former were high in total nitrogen and nitrate nitrogen, while the latter were low in total nitrogen. It is claimed that plants grown with nutrient solutions lacking phosphorus, while high in total nitrogen and nitrate nitrogen, were low in synthesized or protein nitrogen, and that plants grown with solutions lacking nitrogen were low in protein nitrogen.

Photoperiodism in relation to hydrogen-ion concentration of the cell sap and the carbohydrate content of the plant, W. W. GARNER, C. W. BACON, and H. A. ALLARD (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 3*, *pp. 119–156*, *pls. 2*, *figs. 10*).—In a previous publication (E. S. R., 49, p. 326) descriptions have been given of the effect of the duration of daily illumination on plant development. In the present paper the authors give an account of studies of H-ion concentration of tissue fluids and on carbohydrate content and water relations as affected by the length of the daily light period. The investigations are said to indicate that the light period profoundly influences acidity relations, the form of carbohydrate present in the plant, and probably the water content of the tissues.

In the case of short-day plants, indeterminate upward elongation of the vegetative stem, which is characteristic of a relatively long daily illumination period, is associated with progressive increase in active acidity of the plant, particularly in the region of the growing point. The increase is said to continue until the upper portions of the plant become more acid than the lower portions. On the other hand, exposure to a relatively short daily light period sharply limited increase in stature, and under these conditions a brief transitory period of decreased acidity was followed by a moderate increase until a level was approached at which flowering was initiated. Under the short-day exposure the upper portions of the plant were less acid than the lower portions. Abrupt transfer from a long-day to a short-day exposure caused a sudden and sharp decrease in acidity in the region of the growing point, which usually occurred from three to five days after the transfer was made. This drop in acidity is believed to indicate transition from the vegetative to the flowering condition. The acidity relations resulting from exposure to the long days of summer also obtained when the short daylight period of winter was prolonged by the use of electric light of low intensity.

In the case of long-day plants, exposure to a relatively short day tended to inhibit stem elongation, resulting in the leaf-rosette type of development, with or without tuberization. Under these conditions the acidity of the plant remained at a relatively low level.

Preliminary studies, which are being continued, are said to indicate that changes in the form of the carbohydrate content and in the degree of hydration of the tissues of the plant are among the earliest observable effects of change in the length of day to which the plant is exposed.

Changes in hydrogen-ion concentration produced by growing seedlings in acid solutions, J. DAVIDSON and E. T. WHERRY (*Jour. Agr. Research* [*U.*

S.], *27* (*1924*), *No. 4*, *pp. 207–217*).—An account is given of studies on the effect of plant growth on the medium. Wheat seedlings were grown in solutions of hydrochloric, nitric, sulphuric, phosphoric, formic, acetic, oxalic, succinic, benzoic, and phthalic acids, and the changes in reaction produced by their growth were noted.

Of the inorganic acids, the greatest changes were produced in nitric acid at early stages of growth of the seedlings and in phosphoric acid at later stages. As phosphorus and nitrogen are considered the most essential elements of plant growth contained in the acids used, it is concluded that the changes in initial reaction produced by plants are due to absorption rather than to neutralization.

The previous growth of the experimental seedlings in nutrient solutions deficient in acid-forming elements was found to diminish their ability to decrease the acidity of the acid solutions.

The greatest changes from the initial reactions were found in the solutions of organic acids, and it is considered that these may have been due partly or wholly to microbiological activity.

Dehydration of certain plant tissues, V. R. Boswell (*Bot. Gaz.*, *75* (*1923*), *No. 1*, *pp. 86–94*, *figs. 7*).—Investigations made with cabbage and tomato leaves of known degrees of hardiness are described, and the results are presented in tabular and graphical form.

It is shown that in every case the hardy tissue lost water less rapidly than the tender tissue. The differences in the rate of loss varied greatly, depending upon the kind of plant and the treatment. The relative rates of water loss parallel more or less closely their known degrees of resistance to cold. In every case the curve for the hardy tissue starts lower than that for tender tissue, crosses the curve, and ends with the higher value. This shows that the hardy tissue loses water more slowly in the early periods of drying, and consequently has more to lose in the later periods. The curve for the hardy tissue falls less rapidly and in very hardy tissues is almost a horizontal line, indicating that in this case water is held more tenaciously. The water that is held so firmly is presumably in colloidal combination, while that which passes off early in the drying process is probably free water. The differences in the heights of the curves at 60° C. supposedly indicate approximately the relative amounts of colloidal water.

The results suggest that the method of drying described in this paper may be used to estimate the relative amounts of free and unfree water in plant tissues, and that the comparative rates of water loss under uniform drying conditions measure the relative hardiness of certain kinds of plant tissues.

Pectic material in root hairs, C. G. Howe (*Bot. Gaz.*, *72* (*1921*), *No. 5*, *pp. 313–320*).—In testing for the occurrence of conditions indicated by Roberts (E. S. R., 37, p. 128) and by Sampson (E. S. R., 40, p. 325), the root hairs of 20 economic plants grown in sand and loam were examined, as also were those of a few seedlings grown in Knop's solution.

No cellulose was found in the root hairs of the species studied. The root hairs grown in loam or sand showed a layer of pectic material on the outside, and within a layer of callose, thicker in some plants than in others, and usually a little thicker at the tips. The pectic material in most of the cases is at first in the form of calcium pectate or pecose; pectic acid could not be detected with certainty. The pectic layer is somewhat thicker in loam than in sand. The root hairs are somewhat acid in the forms studied and slightly more acid in loam than in sand.

Whether the acidity of the root hair can be ascribed to the presence of pectic material or to some other cause has not yet been determined with certainty.

Subterranean organs of bog plants, F. W. Emerson (*Bot. Gaz., 72 (1921), No. 6. pp. 359–374, figs. 11*).—The present paper deals with work attempting, first, to discover the exact behavior of the underground parts of plants growing in peat bogs, comparing to some extent these organs with those of the same species growing in mineral soil, and, second, to determine as far as possible the factors involved in any observed peculiarities in behavior.

The main station for this study was Cedar Lake, at Lake Villa, Lake County, Ill. Supplementary work was carried on in bogs at Miller and Hillside, Ind., and in a fen at Wolf Lake, Ind.

A comparison of the action of the roots of seedlings under experimental control with observations in the field shows that there are four general types of behavior of subterranean organs in these bogs. These are described.

The roots and rhizomes assume an approximately horizontal position above the water table. Typical forms are *Aspidium thelypteris*, *Picea excelsa*, *Larix laricina*, *Carex filiformis*, *Pogonia ophioglossoides*, *Potentilla palustris*, *Lathyrus palustris*, and *Vaccinium macrocarpon*.

Subterranean systems of plants growing on floating mats were found to be very superficial, nearly all the living tissue being above the water level. No evidence was found to suggest that acidity or toxins are involved in the shallowness of these organs, water level being apparently the important factor, aside from hereditary tendencies in certain species. Roots of codominants were in close competition without apparent damage to them resulting. No marked difference is apparent between the subterranean organs of a given species growing in a bog and those in comparable conditions in mineral soils.

Phylogenetic position of the bacteria, H. H. Heller (*Bot. Gaz., 72 (1921), No. 6, pp. 390–396*).—The author proposes for the bacteria a phylum which is described as constituted of simple one-celled plants that multiply typically by binary fission and occasionally by budding, that show no form of sexual multiplication, that rarely contain cellulose, and that contain no chlorophyll or phycocyanin.

Destruction of mosses by lichens, F. P. McWhorter (*Bot. Gaz., 72 (1921), No. 5, pp. 321–325, pl. 1*).—Lichens are able to destroy moss colonies, partly by parasitism, partly by smothering. The development of lichens in moss colonies makes possible the coming in of a lichen stage after the moss associations.

GENETICS.

Genetics (plant breeding), D. F. Jones (*Connecticut State Sta. Bul. 254 (1924), pp. 154–156*).—The progress of investigations in genetics at the station is reported on briefly. Double-crossed Burr-Leaming corn, the result of combining by cross-fertilization four inbred strains derived from Burr White Dent and Leaming, has continued to outyield the highest yielding varieties grown at the station. The method of improvement known as selection in self-fertilized lines is also being applied in a preliminary way to alfalfa and clover and to some of the small fruits. Endeavors are being made to obtain an earlier field corn than Burr-Leaming and a more uniform sweet corn for canning purposes.

The theory of path coefficients.—A reply to Niles's criticism, S. Wright (*Genetics, 8 (1923), No. 3, pp. 239–255, figs. 8*).—This is a reply to the criticism of Niles (E. S. R., 48, p. 661), in which the author again describes very briefly the application of the theory of path coefficients and severely criticizes many of Niles's statements.

The method of path coefficients.—An answer to Wright, H. E. Niles (*Genetics, 8 (1923), No. 3, pp. 256–260*).—In replying to the above paper, the author feels that his objections to the method of path coefficients have not been overthrown, and states that it seems to him that the method is not fundamentally correct.

Experimental studies on the duration of life.—IX, New life tables for Drosophila, R. Pearl and S. L. Parker (*Amer. Nat., 58 (1924), No. 654, pp. 71–82, figs. 2*).—New life tables for Drosophila, based on the length of life of 2,822 flies of a long-lived inbred strain and 980 flies of a pure vestigial short-lived strain are presented. These tables are compared with the life tables of humans and of the saturniid moth *Telea polyphemus*. The previous study of this series was noted (E. S. R., 50, p. 824).

A note on the entrance of the spermatozoon into the starfish egg, R. Chambers (*Soc. Expt. Biol. and Med. Proc., 20 (1922), No. 3, pp. 137, 138*).—In work at the Cornell Medical College, it has been found that the spermatozoa of the starfish are drawn through the layer of jelly surrounding the egg by means of filaments sent out from the cones where the sperm may enter the egg. These cones were described by Fol in 1876.

The relation of Mendelism to mutation and evolution, W. E. Castle (*Amer. Nat., 57 (1923), No. 653, pp. 559–561*).—The method of inheritance of most of the more economically important characters is explained as usually due to the operation of independent multiple factors having different amounts of influence and probably showing lack of dominance. This type of inheritance has usually been described as blending inheritance. In the progress of evolution, mutations of modifying factors would only be evidenced as slight variations and would not cause the pronounced differences which have frequently been associated with mutations.

Inheritance studies, E. G. Schafer (*Washington Col. Sta. Bul. 180 (1923), p. 31*).—Winter hardiness in a cross between Turkey and Jenkin wheat reacted as a recessive, a majority of the F_3 rows showing severe winter injury. Plants selected from F_3 rows of wheat and oats susceptible to smut continued to be susceptible in F_4, and plants selected from resistant F_3 rows produced resistant F_4 rows. *Tilletia tritici*, after passing one generation on rye, affected wheat without apparent loss of vigor. See also earlier studies (E. S. R., 44, p. 843; 49, p. 223).

F_2 rows of rye×wheat (E. S. R., 48, p. 334) all resembled rye but showed unmistakably their hybrid origin, and 42 of 100 rows were attacked by smut. F_1 plants of Bluestem wheat×*Aegilops cylindrica* and Marquis wheat×*A. cylindrica* were entirely sterile.

An F_3 family of Red Rustproof×Abundance oats produced types both earlier and later than either parent. Of the rows, 83 per cent were immune to covered smut like Red Rustproof, whereas only 1 per cent were as susceptible as Abundance. Red color of glumes and lemmas was dominant, this color apparently being caused by two factors for the lemmas and one factor for the outer glumes. Basal hairs were inherited as a dominant unit character. The awn on the secondary oat seemed to be caused by multiple factors, probably three in number.

Lethal factors in cereals, W. P. Thompson (*West. Canad. Soc. Agron. Proc., 3 (1922), pp. 53–59, figs. 2*).—The behavior of two dwarf wheats in which dwarfness was dominant to tallness and of rye with branching or "Alaska" spikes suggests the presence of balanced lethals.

The inheritance of sickle cell anaemia in man, W. H. Taliaferro and J. G. Huck (*Genetics, 8 (1923), No. 6, pp. 594–598, figs. 2*).—Sickle cell anemia, a diseased condition in man in which the erythrocytes appear crescentic or sickle shaped when the blood is observed in vitro, has been found, by a study of its occurrence in two families, to be inherited as a Mendelian character due to a single factor, dominant to the normal.

Inheritance of proterogyny in maize, J. H. Kempton (*Amer. Nat., 58 (1924), No. 655, pp. 182–187, fig. 1*).—Protogyny, a normal condition in Tripsacum, Euchlaena, and Coix, has been found to be normal also in a variety of maize from Spain. In hybrids with normal protandrous maize the protogynous condition behaved as a recessive character and the F_1 was protandrous. Protogynous plants were recovered in the F_2, though in numbers too few for a simple Mendelian character. The frequency distribution of the F_2 plants of the maize hybrid was very similar to those obtained in teosinte-maize hybrids. From the occurrence of male sterile plants and the character of the frequency distribution, it seems probable to the author that protogyny in maize is the result of a variable expression of a male sterile condition, the variability being brought about through the interaction of modifying factors.

Sheep breeding [at the New Hampshire Station], (*New Hampshire Sta. Bul. 212 (1924), pp. 16*).—This is a report of progress on the experiment of E. G. Ritzman in crossing Southdown and Rambouillets (E. S. R., 49, p. 379). The average fleece from this flock weighed 8.5 lbs., graded as one-half blood staple, and sold for top market price, while the male lambs at 15 weeks of age averaged 67 lbs. F_1s from the Rambouillet-Oxford crosses are to be used in developing the capacity for twinning and higher milk production. Efforts are being made to incorporate into the station flock high fecundity and multinippled characteristics from the flock of the late A. G. Bell (E. S. R., 49, p. 600).

Inheritance of higher fecundity and the mode of transmission, E. C. Foreman (*Michigan Sta. Rpt. 1922, pp. 231, 232*).—The results of a study of this problem have led to the following conclusions:

"(1) A Mendelian interpretation can not be applied to the inheritance of higher fecundity because this character is neither dominant nor recessive. The mating of all high or low production will produce neither all high nor all low. (2) High fecundity is not a sex limited character, but may be transmitted directly to the offspring from either sire or dam. (3) Early maturity is correlated with high fecundity and is usually influenced to a greater degree by the sire than by the dam. . . . (4) High egg production is always associated with constitutional vigor and does not appear to be a unit character."

The genetics of curly wing in Drosophila.—Another case of balanced lethal factors, L. Ward (*Genetics, 8 (1923), No. 3, pp. 276–300, figs. 3*).—Experiments at the University of Michigan have demonstrated the occurrence of a lethal factor united in the second chromosome with the factor for curly wings in Drosophila. Thus curly winged flies are heterozygous. A factor for cinnabar has also been found to be associated with the curly factor. The homologous chromosome to the one containing the curly factor contains a factor for vestigial wings, which is also linked with a lethal.

The presence of at least two factors tending to reduce crossing over in the second chromosome resulted in the production of 2,487 flies from a back cross of curly×a stock carrying six recessive factors in the second chromosome, without a single crossover. A few crossovers did occur, however, when the environmental temperature was raised to 30° C. (86° F.), and one of the noncrossover factors was lost, allowing crossing over to occur in one end of the second chromosome. Crossing over continued to occur when the treated stock of flies was raised at normal temperatures.

The presence of the balanced lethals with the factors preventing crossing over accounts for the apparent true breeding of curly winged stocks.

Radium radiations and crossing over, H. H. PLOUGH (*Amer. Nat., 58 (1924), No. 654, pp. 85–87*).—A brief account is given of experiments carried on at Woods Hole with Drosophila, in which increases in the crossing over percentages occurring in the region of black-purple and curved genes in the second chromosome were produced by radium radiations.

Inbreeding the Rhode Island Red fowl with special reference to winter egg production (preliminary report), F. A. HAYS (*Amer. Nat., 58 (1924), No. 654, pp. 43–59*).—A study of the effects of inbreeding on winter egg production has been made from the records of the inbreeding experiments with Rhode Island Reds carried on by H. D. Goodale at the Massachusetts Experiment Station during 1919, 1920, and 1921. The plan of the test was to concentrate the blood of one hen by breeding the hens used to a son sired by a son of this hen in producing the 1920 flock. In 1921 the sisters were mated to their full brothers. The results of the study indicated that there was a tendency toward a decreased winter egg production as the amount of inbreeding increased. Differences were observed in the effect of inbreeding on the offspring of the various individuals used, probably because of differences in their genetic composition. The variability in the winter egg production of daughters of the same hens was reduced through inbreeding, but the age of maturity was retarded, though the weight of inbred birds was fairly well maintained.

The author discusses the genetic factors controlling winter egg production, and gives the probable genetic formula of each bird used and a comparison of the expected and actual offspring obtained. Seven pairs of factors are considered responsible for winter egg production: E (sex linked) and E′ causing early maturity, M winter molting, A and C broodiness (E. S. R., 44, p. 870), and R and R′ causing a high rate of production.

The effects of alcohol fumes on the albino rat: Introduction and sterility data for the first treated generation, F. B. HANSON and V. HANDY (*Amer. Nat., 57 (1923), No. 653, pp. 532–544, figs. 2*).—This is the first paper of a series to report a study carried on at the Washington University, St. Louis, of the effect of alcohol fumes on the development and fertility of several generations of treated rats. The original young of 2 litters of 10 each were divided into equal lots and one lot treated daily with sufficient alcohol fumes to cause narcotization in a closed chamber from 16 days of age to maturity. The other lot was maintained as a control. Body measurements, weights, and the fertility of both treated and control rats are to be recorded. The authors summarize the effects of the treatment on the fertility of the first generation as follows: "Of the 6 treated females of the first generation, therefore, 3 were rendered completely sterile; 1 had its germ cells so injured that the single litter it threw died in a few days; 1 had suffered less injury, but was not able to bring any of her 8 litters, with the possible exception of 1, to full term; while the sixth produced 4 litters, of which 3 were normal."

One of the control females proved sterile, but the other 4 produced 12 litters or a total of 86 young as compared with 26 by the 1 fertile treated female. One of the treated females became pregnant 8 times, but the litters were slowly absorbed 6 times, 1 litter was aborted, and 1 litter of 1 was born dead.

The structure of the vertebrate eye as an index of developmental deficiencies, with the bearing on recent inheritance studies, C. R. STOCKARD (*Amer. Nat., 58 (1924), No. 654, pp. 24–35*).—This is a discussion of the manner in which the development of the eye is arrested in vertebrates by any factor which interferes with the general development of the embryo. Evidence of interference with eye development is particularly cited from the work of Guyer and Smith (E. S. R., 44, p. 566), in which antibodies to the lens of rabbits produced abnormalities in the eye, as the authors explain, through interfering with the general development, and from the works of C. C. Little and H. J. Bagg, in which X-rays produced germinal modifications in mice, resulting in maldevelopment of the eyes. The blind forms of life in caves are usually weaker than similar forms with sight, indicating that the weaker developing types have developed abnormalities of the eyes.

The oestrous cycle in the rat and its associated phenomena, J. A. Long and H. McL. Evans (*Calif. Univ. Mem., 6 (1922), pp. 148, pls. 11, figs. 8*).—The results of a study of the oestrous cycle in the rat, carried on at the University of California, are reported in detail. The changes during the oestrous cycle and ovulation have been divided into five stages, which are closely correlated with the histological changes in all of the reproductive organs. The occurrence of these changes may be ascertained in the living animal by microscopic examinations of the vaginal contents. The order is much the same as previously noted in the mouse (E. S. R. 50, p. 826) and in the guinea pig (E. S. R., 40, p. 467).

A careful study of the corpora lutea showed that there were four kinds, i.e., corpora lutea of ovulation, copulation, pregnancy, and lactation, which persist for different lengths of time though they have similar structures. A comparison of the number of young born with the number corpora lutea formed indicated that only about two-thirds as many young occurred as there were ova discharged. The age of sexual maturity, as measured by the first coitus, varied from 63 to 107 days, averaging 92.7 days, and as measured by the first ovulation varied from 45 to 147 days, averaging 77 days. The gestation period was found to be 21.5 to 22 days. The changes in the vaginal contents during pregnancy and lactation indicated that none of the usual oestrous changes occurred, but at about the fourteenth day of pregnancy the floor of the vagina was covered with a film of red blood corpuscles. This was the first definite sign of pregnancy.

A study of the formation of the vaginal plug was also made and the effect of copulation and mechanical stimulation of the cervix of the uterus with a glass rod were found to delay the succeeding ovulation by producing changes in the reproductive tract during a short period which simulated pregnancy. Deciduomata could be produced by drawing a thread through a horn of the uterus provided the operation was done at least 3 days after ovulation. Anything prolonging the life of the corpora lutea such as copulation, etc., tended to prolong the life of the tumor, but resorption started as soon as the next oestrous period occurred.

The effects of the removal of various parts of the reproductive tract on the occurrence of oestrum were studied in a number of animals, and it was found that the normal changes occurred if the ovaries were not removed and even when the ovaries were transplanted to other parts of the body. These determinations were made by vaginal smears. The total length of the oestrous cycle in rats was found to vary from 3 to 13 days, with a general average of 5.4 days. Seven hundred and eighty-nine of the 1,999 cycles observed were 4 days in length and 634 were 5 days long, showing that the model length of the oestrous cycle was between 4 and 5 days.

On the weight of the ovaries in the albino rat during gestation and normal lactation, also in females deprived of their newborn litters, J. M. Stotsenburg (*Amer. Jour. Physiol., 65 (1923), No. 1, pp. 77–89, figs. 3*).—The body weights and weights of the ovaries are given of female rats killed at

2-day intervals during gestation, during the 20 days following parturition while the young were suckling, and during 26 days following parturition when the young were removed. The results showed that the weight of the ovaries decreased during gestation to the twelfth day, after which there was an increase to the time of parturition. The number of corpora lutea present influenced the amount of this increase. The weight of the ovaries decreased during the normal lactation period, but when the litter was removed the lactation ceased, and the reduction in weight stopped at about the fourth day when the oestrous cycle was renewed. Some differences in the weights of the right and left ovariès were observed, but the ovary of neither side was uniformly heavier than the other. No relationship was noticed between the weights of ovaries and conditions which cause females to kill their young. The ovaries of mated females were usually much heavier than those of the unmated females from Donaldson's work (E. S. R., 40, p. 546).

A sexual activity rhythm in the female rat, G. H. Wang (*Amer. Nat., 58 (1924), No. 654, pp. 36–42, figs. 3*).—The activity of female rats, as measured by the revolutions of a revolving drum, was found to occur in cycles which were usually four days in length. The height of this activity was found to be associated with the oestrous period. Males and immature, pregnant, or overiectomized females did not show the cyclic rhythm in their activity.

Intertubular tissue in the testes of certain birds, H. D. Goodale (*Amer. Nat., 58 (1924), No. 654, pp. 92, 93*).—A few sections of tests of wild birds which have been examined have revealed the presence of very large, conspicuous cells, called lymphocytes by J. F. Nonidez, forming a tissue in the intertubular spaces of the testes of chestnut sided, myrtle, and Maryland yellow-throated warblers. Such cells were, however, absent from the testes of a brown thrasher, several English sparrows and domestic ducks, and demonstrated with difficulty in the testes of a robin and a bluebird.

Luteal cells and hen-feathering, H. D. Goodale and J. F. Nonidez (*Amer. Nat., 58 (1924), No. 654, pp. 91, 92*).—Sections of the testicles from 12 cockerels of a hen-feathered strain were examined for any relationship between the character of the luteal cells or the lymphoid cells and the occurrence of cock or hen-feathering. No relationship was observed, but the amount of intertubular material was large in the hen-feathered males.

FIELD CROPS.

[Field crops work in Delaware, 1923], G. L. Schuster (*Delaware Sta. Bul. 135 (1924), pp. 7, 9, 10, fig. 1*).—Experiments with crop rotations and green manure crops and a comparison of Hubam with perennial sweet clover are reported on briefly.

In studies of the effect of fertilizers and lime on the yield, maturity, and composition of soy beans (E. S. R., 47, p. 531), lime increased the average acre yield and protein content of soy beans but seemed to delay maturity and depress the oil content. Potassium chlorid produced the most of any of the single elements and in combination with phosphatic fertilizers gave the greatest yield. Sodium nitrate did not give satisfactory returns. Fertilizers did not seem to produce any significant change in the oil or protein content of the soy beans. The total yield of protein and oil content per acre appeared to be closely related to the total yield of beans per acre.

[Field crops experiments in Georgia, 1923], (*Georgia Sta. Rpt. 1923, pp. 39–42, 43, 44, 49, fig. 1*).—The leading varieties of wheat, oats, barley, rye, corn, and cotton are indicated, and the progress of breeding and selection work with wheat, oats, and barley is described as heretofore (E. S. R., 49, p. 524), with notes on comparative yields and spacings of corn, sorghum, and sunflowers for silage and improvement work with Bermuda pasture.

In a triangular fertilizer test with cotton, in cooperation with the U. S. Department of Agriculture, an abundance of nitrogen appeared of prime importance in growing cotton on Piedmont soils, with phosphates next and potash last. Readily available sources of nitrogen, such as sodium nitrate or ammonium sulphate, seemed to give the largest and cheapest yields obtained under boll weevil conditions. The maximum yields with sodium nitrate resulted when applied at the rate of 166 lbs. per acre, and with both sodium nitrate and ammonium sulphate there were higher yields when applied at planting time rather than later. The beneficial effect of additions of limestone to cotton land, at least on the Cecil clay loam soil, were shown, and raw phosphates again demonstrated considerable value as a source of phosphorus for cotton. While less than 20 lbs. of potash per acre was not found enough, no advantage accrued from heavy applications.

Increased applications of nitrogen responded with increased yields of corn in a triangular test, whereas phosphates and potash had little effect. Topdressing corn in mid-July did not prove profitable in a dry season.

The best stand of bur clover, sown in corn middles, was obtained when a furrow was opened with a scooter and the seed covered with barnyard manure. Placing acid phosphate in the row and leaving the seed uncovered gave almost as good a stand, while seeding in the furrow without further treatment resulted in a poor stand and seed broadcast was a total failure.

Results during five years indicate that a 3-8-3 fertilizer is most suitable for sweet potatoes on Piedmont soils.

[Agronomic work in Michigan], J. F. Cox and H. R. Pettigrove (*Michigan Sta. Rpt. 1922, pp. 214–217, 241*).—The progress of breeding work and varietal studies with alfalfa, clover, corn, field beans, flax, potatoes, pop corn, rye, sugar beets, and wheat are described briefly.

Notable among varieties at the Upper Peninsula Substation were Wisconsin Pedigree No. 77, Iowa No. 103, Silvermine, and Sixty-Day oats; Wisconsin Pedigree No. 9 and Michigan Black Barbless barley; English field peas; and of the annual hay crops, oats and peas. Cultural experiments showed the best returns from mid-May seeding for barley, late-August seeding for winter wheat, and 30-in. rows at the rate of 6 lbs. per acre for sunflowers.

[Field crops experiments at the Crookston, Minn., Substation, 1922], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 12, 13, 14, 16–28, 30, 31–40, 69–81, figs. 11*).—The progress (E. S. R., 48, p. 331) is reported of experiments with various field crops including variety tests with spring wheat, oats, barley, rye, corn, flax, sweet clover, soy beans, potatoes, carrots, mangels, rutabagas, turnips and sugar beets; comparison of cereal mixtures; seeding trials with wheat, barley, oats, rye, flax, and potatoes; time of cutting wheat and oats; fertilizer tests with potatoes and studies of the residual effect of fertilizers on varieties of alfalfa and sweet clover; seed selection work with potatoes; and rotations.

The results of trials of winter wheat by this station and farmers in the Red River Valley and milling tests thereon are summarized, and the merits of rotations are indicated. The 3, 5, and 7 year rotations tested were satisfactory, but the 7-year rotation was the weediest. Rotating wheat, barley, and oats has shown no increase over continuous production.

Varieties of oats and wheat were cut at the green neck, yellow neck, and dead ripe stages. Excepting one variety, oats cut at the yellow neck stage weighed as much as when cut when ripe and were without marked color differences. Marquis, Preston, and Ruby wheat cut in the yellow neck stage weighed less than when cut dead ripe. No loss of weight occurred in Mindum and Kota wheats.

Sow thistle seed buried 7 in. deep was not killed, but its growth was much retarded as compared with seed planted nearer the surface.

Hot formaldehyde and corrosive sublimate proved almost equally effective for potato diseases. Inoculated sulphur was applied at the rate of 400 lbs. per acre on soil known to be infected with certain potato diseases, and Early Ohio, Irish Cobbler, and Green Mountain potatoes treated with corrosive sublimate were planted on both sulphured and untreated plats. The crops from all three varieties were practically 100 per cent infected with black scurf and scab, the tubers having generally only a few scab specks each but enough rhizoctonia to make them appear dirty and dingy. Although the results from the.one-year trial are not held conclusive, they are thought to indicate that with the heavy Fargo clay loam soils the chemical reaction in the soils resulting from the sulphur application must be studied for a full explanation of the lowering yields, and that inoculated sulphur can not be recommended for control of tuber diseases or disease infected soil. Potatoes produced maximum yields with three applications of Bordeaux, and those sprayed with Pyrox outyielded potatoes treated wtih Bordeaux.

Growing alfalfa, sweet clover, and soy beans in the Red River Valley, R. S. Dunham (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 90–101, figs. 3*).—Based on experiments at the Crookston Substation, cultural methods, field practices, and varieties are recommended for growing alfalfa, sweet clover, and soy beans for different purposes in the Red River Valley.

[Field crops work at the Morris, Minn., Substation, 1922], P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1922, pp. 27–49*).—Experiments reported in continuation of earlier work (E. S. R., 48, p. 332) included varietal trials of spring and winter wheat, oats, barley, winter rye, corn, soy beans, field beans, alfalfa, and potatoes; seeding tests with winter wheat, rye, and potatoes; cultivation and spraying tests with potatoes; rotations; and production of certified seed. The tabulated results from different rotations are in harmony with previous conclusions. Potato yields again favored spraying with Bordeaux mixture for eary blight, 3-in. depth of planting, and level surface cultivation.

[Field crops work at the Delta, Miss., Substation, 1922 and 1923], W. E. Ayres (*Mississippi Sta. Bul. 221 (1924), pp. 6–10, 12*).—Variety, cultural, and fertilizer trials with corn, and variety tests with oats, soy beans, and cowpeas for hay, and sorghum; comparisons of forage crops after oats; and breeding work with corn, cotton, and oats were carried on in continuation of earlier work (E. S. R., 49, p. 428). Cotton experiments were similar to those noted (E. S. R., 49, p. 225).

Experimental results suggest, as the optimum spacing for corn, single plants 2 ft. apart in 4-ft. rows or 2.25 ft. apart in 3.5-ft. rows. Planting legumes in corn seemed to reduce the corn yields, but the combined value of the two crops exceeded that of corn alone. Applied on land yielding about 40 bu. per acre without fertilizer, at such rates as to add 15 lbs. of nitrogen per acre, there were obtained with ammonium sulphate increased yields of 18.1 per cent, sodium nitrate 16.8, cottonseed meal and sodium nitrate 18.1, and cottonseed meal 12.5 per cent. Applications of sodium nitrate resulted in increases ranging from 3.6 per cent from 50 lbs. per acre to 36 per cent from 250 lbs. and 37 per cent with 300 lbs. of sodium nitrate. At the first or second cultivation seems the best time for applying sodium nitrate to corn.

Yields of 30 to 50 bu. of oats per acre were produced in 1923 in nut grass-infested, low, tight buckshot soil without further preparation after the removal of soy-bean hay, the oats being drilled in the soy-bean stubble at a cost of less than $3 per acre for seed and labor.

[Field crops work on the Scottsbluff, Nebr., Experiment Farm in 1920 and 1921], J. A. HOLDEN (*U. S. Dept. Agr., Dept. Circ. 289* (*1924*), *pp. 8–22, 23–29, figs. 3*).—Investigations along similar lines as noted earlier (E. S. R., 45, p. 530; 49, p. 733) are reported. Rotation experiments under irrigation have been discussed elsewhere (E. S. R., 49, p. 328).

Although plowed land has given slightly higher yields of sugar beets than disked land, disking would probably permit earlier planting in a year with a backward spring, which would more than compensate the difference in favor of plowing. Delay in planting after plowing resulted in heavy decreases in tonnage of sugar beets. Plats receiving manure showed marked increase in yield, but the immediate gain was not in proportion to the amount of manure applied. The residual effect was much greater from the heavy applications than from the light ones. Where the supply of manure is limited and when immediate results are desired, it is deemed better to apply it at the rate of 10 or 12 tons per acre, but where manure is abundant heavy applications are advisable. Commercial fertilizers produced a slight increase, which was not so marked as where barnyard manure was used.

Potatoes after alfalfa have given a 9-year average acre yield of 280.8 bu., after manure 202.2, and in rotations including neither manure nor alfalfa 144.4 bu. Varieties (E. S. R., 48, p. 336) of potatoes are indicated for the North Platte Valley. Later plantings appear to give smaller yields but the tubers grade better.

Experiments with seed potatoes reported on by H. O. Werner (E. S. R., 50, p. 335) showed that no one State has a monopoly on good seed potatoes. The quality and yield of potatoes depend largely upon seed selection, disease control, and the climatic conditions under which the seed tubers have been produced. Spacing tests suggest that Triumph and Downing potatoes can be planted most profitably on fertile irrigated soils at distances not to exceed 12 in. apart in the row. Potatoes of the Triumph variety irrigated more than one year did not appear very desirable for seed purposes. Potatoes grown under uniform irrigation treatment from seed from lots grown on dry land and receiving different irrigation treatments the previous year gave yields in inverse relation to the amount of water applied to the seed plats.

The residual effect of alfalfa was shown to be very beneficial to corn, nearly doubling the average grain yield. Acclimated varieties of corn are advised.

The average yields of winter wheat, spring wheat, oats, barley, corn, and sorghum under various cultural conditions and in rotations in dry land experiments are given by C. Harris. A detailed account of dry farming investigations at this substation has been reported already (E. S. R., 49, p. 527).

[Field crops work in New Hampshire, 1923] (*New Hampshire Sta. Bul. 212* (*1924*), *pp. 24–26, 28, 29–31, 33, 34*).—Selection work with timothy, variety tests with red clover and silage corn, top-dressing hay land with nitrogenous salts, pasture improvement studies, and potash and seed tests with potatoes were carried on by F. W. Taylor and O. Butler in continuation of previous work (E. S. R., 49, p. 328). Fertilizer tests with potatoes by J. R. Helper on garden soils are also reported.

When manure is used for the potato crop, the larger applications of potash do not appear desirable or profitable. Certified potato seed produced about 25 bu. per acre more than home-grown noncertified seed. Seed grown in southern New Hampshire consistently yielded much less than seed of the same strain of potatoes grown simultaneously in Maine. Yields and field observations with certified Green Mountain potatoes showed seed pieces from the bud end and stem end of the tuber to be about equally fertile.

[Field crops investigations in Washington], E. G. SCHAFER, M. A. MCCALL, C. E. HILL, and R. P. BEAN (*Washington Col. Sta. Bul. 180 (1923), pp. 29, 30, 59–62, 63–65, 66, 67*).—As in the previous report (E. S. R., 49, p. 223), prominent varieties of wheat, oats, barley, field peas, corn, and alfalfa, and their average yields at the station or substations are pointed out, together with the results of seeding and cultivation tests and notes on smut resistance with wheat. Cowpeas and soy beans were not adapted to conditions at the station.

Ridit wheat resulting from a cross between Turkey and Florence is a winter variety with red grain and a stiffer straw than Turkey, is beardless, and seems to be thoroughly winter hardy. It is similar to Turkey in milling quality. At Pullman, Ridit compared favorably in yield with the best winter varieties and was immune to stinking smut.

A study at the Adams Substation at Lind of moisture usage by the wheat plant in the field as influenced by variety, data of seeding, and soil condition indicated a very close relationship between the photoperiodic optimum of any given variety and the most efficient use of moisture by that variety. Relative drought resistance is probably largely determined by the occurrence of the favorable photoperiod at such a time during the growing season as will give the largest growth and the best opportunity for complete maturity before the limited moisture supply is exhausted. A variety drought resistant in one environment may not necessarily be so drought resistant in another.

Varietal results with wheat were not in agreement with those at Pullman or at Waterville and emphasized the necessity of more definite knowledge of the physiological complex of varieties before making general recommendations. The correlation of seasonal conditions with varietal performance appears to give a very clear indication of the time and place different varieties should be grown.

The yields of Turkey winter wheat in a spring harrowing experiment, taken together with results at Waterville, are not thought to justify harrowing as a regular practice. Harrowing immediately after the drill or the use of press wheels appeared to increase spring wheat yields. Cultural experiments with wheat at Lind, in cooperation with the U. S. Department of Agriculture, have been reported in detail from another source (E. S. R., 49, p. 828).

Experimental results at the Waterville Substation and farm practice indicate that all lands that can not be plowed by May 1 should be plowed the previous fall, or disked early in the spring to hold moisture until the time of plowing. Fall plowing is preferred to spring disking and late plowing if the plowing can not be done before the last of May. Maximum yields may be obtained when the summer fallow, from plowing until time of seeding in the fall, is given only sufficient tillage to control weed growth and to prepare a firm, level seed bed.

At the Irrigation Substation, alfalfa cut when one-fourth in bloom averaged 6.4 tons per acre, one-half in bloom 7.47 tons, and three-fourths in bloom 7.45 tons.

[Report of the Wyoming Station agronomy department] (*Wyoming Sta. Rpt. 1923, pp. 48–52, 64, 65*).—Potatoes following alfalfa in a rotation have produced almost double the yield of those grown on land continuously in grain, and were much less scabby. Closer planting of potatoes with seed pieces not more than 6 to 12 in. apart gave the greatest total yields and the highest production of marketable tubers. Large-sized seed proved best in dry years, while in wet years differences were not apparent between large and small seed.

Results obtained at Archer in cooperation with the U. S. Department of Agriculture indicate that planting winter wheat with high furrows to protect the plant from the wind will insure the success of winter wheat production in the surrounding country. The merits of Acme durum wheat, crested wheat grass, and local selections of corn were also demonstrated.

[Report of field crops work in Punjab, India], D. MILNE ET AL. (*Punjab Dept. Agr. Rpt. 1922, pt. 1, pp. 4–7, 14–22, VII–XI, XXXIII–XXXVII, pls. 4*).—These pages supplement and describe the continuation of work noted earlier (E. S. R., 49, p. 31.)

Handbook of breeding of agricultural plants, C. FRUWIRTH ET AL. (*Handbuch der Landwirtschaftlichen Pflanzenzüchtung. Berlin: Paul Parey, 1923, vol. 4, 4. ed., rev., pp. XVI+483, figs. 43*).—A revised edition of the volume previously noted (E. S. R., 45, p. 35), covering The Breeding of the Four Principal Cereals and Sugar Beets.

Factors in successful inoculation of legume crops, P. W. ALLEN (*Washington Col. Sta. Bul. 180 (1923), pp. 16, 17*).—Wind storms, dust storms, and mud storms appear to be negligible factors in the distribution of legume bacteria in eastern Washington. The drying out of soils during long, hot summer droughts was found responsible for the killing of most legume bacteria of the soil. Seeds well inoculated with vigorous legume bacteria were found to be practically sterile after six months' storage in a moderately dry place, showing that the inoculation of legume crops by persistence of viable legume bacteria on the seeds from one season to another does not generally occur.

Seeding small grain in furrows, S. C. SALMON (*Kansas Sta. Tech. Bul. 13 (1924), pp. 4–55, figs. 16*).—The merits of seeding small grain in furrows are discussed, and a résumé is given of experimental results in Kansas and elsewhere with this method of seeding.

Considerable losses of winter cereals from winterkilling and soil blowing may doubtless be prevented by seeding in furrows somewhat deeper and farther apart than usual. Among advantages cited are protection by preventing snow from drifting from the fields and by reducing exposure of the plants to cold drying winds, better and more certain germination under some conditions, and a possibility of better drought resistance. Temperature records show a marked difference in minimum winter temperatures in favor of the furrow method, the difference increasing with the depth of furrows. The meager data forbid conclusions regarding the value of the method for spring grain.

In the Colby area and northward and westward the hazards of winterkilling, soil blowing, and drought seem sufficient to justify more extended trials of this method on a field scale. Results at Manhattan do not suggest extensive use of the method in that section, and south of Hays its advantages may be limited to protecting the grain from soil blowing and drought and insuring better germination.

Seeding in furrows may reduce yields where winters are mild and rainfall high, but may be of some value in subhumid areas where heaving is an important factor. Increased erosion is indicated on sloping soils where the furrows extend up and down the slope. The relative importance of seeding east and west as compared with seeding north and south will depend upon the best protection afforded during the winter and perhaps on the relative rate of growth in the spring. At Manhattan the grain in north and south furrows apparently tended to grow more rapidly in early spring than that in east and west furrows. Marked differences were not demonstrated in the rate of seeding required as compared with the ordinary method. Until more data are obtained, a maximum distance of 12 in. between rows is thought safest.

Most of the drills for seeding in furrows have proved unsatisfactory principally because they do not operate to advantage in trashy ground or because of heavy draft. It is thought that these difficulties have been reduced, avoided, or overcome with a new type of drill which uses disks for opening the furrows.

Barley varieties under different conditions in Norway [trans. title], K VIK (*Aarsberet. Norges Landbr. Høiskoles Akervekstforsøk, 32 [1920–21], pp. 41–52*).—Results of numerous trials on demonstration fields with barley varieties between 1907 and 1920 substantiated routine experiments showing that in northern Norway (north of 65°) and in mountainous sections, both with short growing periods, only native early ripening varieties such as Dønnes, Bjarkøy, and Kvefjord can thrive. These mature in about three months and have less straw than most other barley varieties. They are said to produce rather high grain yields in mountain regions. The kernels are rather slender, exhibiting mostly a bluish tint with the gluten cells containing a blue coloring matter.

Asplund, a 6-rowed pure-line selection, led in grain yields in regions with long growing periods, particularly in southeastern Norway. Its straw is short and unusually stiff, and its grain, although small, is plump and of good quality. Maskin barley, second to Asplund, also has short and stiff culms, but ripened earlier and showed itself adapted for regions intermediate between those indicated for the earliest sorts and for Asplund. Two-rowed barleys generally had lower grain yields than 6-rowed, especially in districts with short growing periods.

Clover failure, A. J. PIETERS (*U. S. Dept. Agr., Farmers' Bul. 1365 (1924), pp. II+25, figs. 9*).—By clover failure is understood the complete or partial loss of a stand of red clover or the failure to secure a stand after seeding. The decline of clover culture in recent years is reviewed; the causes of clover failure including unsuitable soil conditions, unadapted or poor seed, poor methods of seeding, diseases and insects, and wrong treatment in the autumn of the first year are discussed; and remedial measures are suggested.

Cotton, J. C. OVERPECK and W. T. CONWAY (*New Mexico Sta. Bul. 141 (1924), pp. 17, figs. 3*).—Cultural and field methods, irrigation practices, and varieties are recommended for the production of cotton under irrigation and on dry land in New Mexico. Insects and diseases are commented on briefly.

The results of variety trials at the station from 1920 to 1923, inclusive, show Acala to outyield other varieties with Triumph and Durango next in order of merit. Most of the cotton grown in the State is said to be either Durango or Acala, Durango being grown most extensively in the Pecos Valley and Acala in the Mesilla Valley.

Bavarian flaxseed [trans. title], G. GENTNER (*Faserforschung, 3 (1923), No. 4, pp. 277–300*).—Comparison of flaxseed from many sources gave evidence that Bavarian flaxseed closely resembles flaxseed from middle and southern Russia in its weed-seed content. However, flaxseed from western Bavaria is similar to seed from the Netherlands. Bavarian flaxseed differs from the north Russian seed by the frequent occurrence of *Cuscuta epilinum*, and from the middle and south Russian seed by the lack of *Echinosperma lappula*. However, this weed does not run regularly in middle and south Russian seed, so it has only a relative value. The frequent occurrence of Russian black soil often serves to differentiate Bavarian and Russian seed. Bavarian and generally German flaxseed and clover seed are often characterized by seed of *Lapsana communis*, which seldom or never occurs in seed of other origin.

Sprouting of seed potatoes before planting [trans. title], A. P. LUNDEN (*Aarsberet. Norges Landbr. Høiskoles Akervekstforsøk, 32 [1920–21], pp. 9–*

40).—Because of the prolongation of the vegetative period, sprouting of seed potatoes is held of value, particularly in districts with short summers or in unfavorable years. Experiments with sprouted seed potatoes in Norway from 1913 to 1921, inclusive, are reported, supplementing earlier work (E. S. R., 30, p. 333).

At Aas, in southeastern Norway, about 100 meters (328 feet) above sea level, sprouted seed produced increases in yields averaging 14 per cent and sprouted seed with only one sprout remaining, 12 per cent. Late maturing varieties have given the greatest increases with sprouting, and the earlier varieties have shown the least increases. Dry rot seemed to decrease slightly after sprouting, and the dry matter content averaged 0.27 per cent less in the crop from sprouted seed. More large tubers were obtained from sprouted seed, Sprouted seed with only one sprout remaining gave about the same number of plants as the ordinarily sprouted or unsprouted seed.

At Abjørsbråten in the interior highland of south Norway, seed sprouted for four weeks gave an average increase of 22 per cent and for six weeks 33 per cent. With four weeks' sprouting medium early varieties gave almost as large average increases as the late sorts, whereas with seed sprouted six weeks the late varieties made the larger increases.

Fertilizing rice in southwestern Louisiana, O. JASCHKE (*Amer. Fert., 60* (*1924*), *No. 7, pp. 26, 27*).—Experience in the use of fertilizers on the rice crop of southwestern Louisiana is described briefly.

Growing and using sweet clover in Montana, C. McKEE (*Montana Sta. Circ. 118* (*1923*), *pp. 32, figs. 16*).—Varieties, cultural and field methods, and management practices are suggested for growing sweet clover in Montana for pasture, hay, soil improvement, and seed, and in rotations. The preparation of sweet clover seed for market and the crop as a honey plant are discussed briefly, and the opinions of farmers regarding sweet clover are appended.

Methods of covering grass seeds, R. D. WILLIAMS (*Jour. Min. Agr.* [*Gt. Brit.*], *30* (*1924*), *No. 12, pp. 1134–1139*).—A further series of experiments (E. S. R., 50, p. 34) carried on at Aberystwyth, Wales, in 1923 concerned the methods of covering the seeds of perennial rye grass, meadow foxtail, timothy, and rough-stalked meadow grass. The seeds were broadcasted by hand without a nurse crop at the uniform rate of 91.8 viable seeds per square foot and were covered by farm implements commonly used for the purpose. The experimental evidence in this and earlier papers may be summarized as follows:

Good catches of the grasses and clovers tested were shown to depend very largely upon the thoroughness with which the seeds were covered. Even the small seeds of timothy and rough-stalked meadow grass gave far better catches when harrowed in than when left on the surface or when merely rolled in. No advantage seemed to be gained by sowing the large and small seeds of a mixture separately provided the seeds were covered by the chain harrow.

The peg and chain harrows were the best of the implements employed for covering the large seeds of Italian rye grass, perennial rye grass, cocksfoot, meadow foxtail, and red and white clovers and gave about equally good results. The chain harrow proved better than the peg harrow for covering small seeds. The horse hay-rake and the Cambridge roller did not give as reliable results as the harrows. Although the differences between the results of the two presowing operations were generally small, the plats chain-harrowed as the last operation before sowing usually gave slightly better stands than the plats rolled just before sowing.

A very considerable but an unaccountable loss of viable seeds were observed, amounting to about four-fifths of the seeds sown in the case of meadow foxtail and rough-stalked meadow grass, even when the seeds were covered by the chain harrow, the most effective implement.

Longevity of alfalfa and clover seeds, G. P. McRostie (*Sci. Agr., 4* (*1924*), *No. 8, pp. 236–238*).—Germination tests were made in 1920 at Macdonald College, Quebec, on alfalfa, red clover, and alsike clover seed from the crops of 1911 to 1919, inclusive, held under good storage conditions.

Two- and three-year-old seeds in all lots of red clover and alfalfa gave an average germination equal to that of new seed, while the germination of alsike seed three years old dropped below 90 per cent. The yellow red clover seeds seem to lose their vitality slightly faster than the purplish seeds after the third or fourth year but not enough to warrant any serious discrimination as regards relative value. The rapid decline in germination in all samples of alfalfa and red clover after the ninth year would indicate the rapid approach of the limit of storage in a viable condition. A well-marked tendency toward longevity was noticeable in different generations of certain strains.

HORTICULTURE.

[Horticultural investigations at the Delaware Station], L. W. Tarr and L. R. Detjen (*Delaware Sta. Bul. 135* (*1924*), *pp. 16, 17, 20–25*).—A study by Tarr of the chemical composition of peaches harvested at frequent intervals from plats receiving different fertilizer treatments indicated that in the early stages of development peaches contain starch and reducing sugars, while at the approach of maturity the reducing sugars steadily decline to a constant percentage of 2.25 to 2.75, the starch content becomes greatly reduced, and the sucrose increases steadily. In the dead-ripe stage sucrose decreases very rapidly, with a corresponding increase in reducing sugars.

A study by Detjen of some environmental factors concerned in the dropping of immature fruits included daily records upon peach, plum, and apple trees, beneath which were placed wire screens to catch the falling fruits. A rather curious phenomenon observed was the dropping from April 21 to 29 of apparently normal peach fruit buds. Air and soil temperatures and moisture records were taken daily, and transpiration was studied with the aid of a Livingston atmometer.

Fertilizer studies with apple trees again indicated that nitrogen is the limiting factor to apple production in Delaware. However, the largest and highest quality yields were produced where all three materials, nitrogen, potash, and phosphoric acid, were used in combination.

Considerable progress was obtained in an attempt to isolate strains of cabbage that would breed true for head type. One roundheaded plant yielded 65 per cent of roundheaded progeny, and one pointed headed plant yielded all pointed progeny. Certain off type strains characterized as zinnia rosettes were found to breed true. The tendency for self-sterility in the cabbage, rather fully discussed in last year's report (E. S. R., 48, p. 634), renders the perpetuation of isolated strains exceedingly difficult.

[Horticultural investigations at the Georgia Station] (*Georgia Sta. Rpt. 1923, pp. 44–49, fig. 1*).—Data obtained following the severe freeze on March 19, 1923, showed marked varietal differences in the frost resistance of peach flower buds. That partial killing of buds is not necessarily a serious condition was indicated in the fact that at least 50 per cent of the varieties examined subsequently bore full crops of fruit despite the fact that the bud mortality ranged from 20 to 90 per cent, averaging approximately 58 per cent. No definite association was established between the stage of bud development and hardiness, since five varieties not in bloom at the time of the frost lost an average of 48 per cent of their buds.

Of 500 Elberta peach seedlings, the seeds of which were sown in 1911, 4 showed sufficient promise to be propagated. Resistance to nematodes was observed in peach seedlings raised from Florida seed (E. S. R., 50, p. 140).

Brief mention is made of fertilizer studies with watermelons at Brooklet, Ga., where an attempt to associate white heart and quality with various kinds of fertilizers led to negative results (E. S. R., 51, p. 40).

[Horticultural investigations at the Michigan Station], C. P. HALLIGAN (*Michigan Sta. Rpt. 1922, pp. 228–230*).—Detailed cost records are presented upon five types of soil management in operation in an apple orchard at the Graham Horticultural Substation, namely, (1) clean cultivation with cover crop, (2) clover with straw mulch, (3) alfalfa with straw mulch, (4) alfalfa with alfalfa mulch, the second and third crops removed, and (5) same as (4), but supplemented with 0.5 lb. of nitrate of soda per tree.

[Horticultural investigations at the Crookston, Minn., Substation], C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 13, 57–69, figs. 5*).—As in the preceding report (E. S. R., 48, p. 338), brief notes are given upon the hardiness, yielding capacity, and general behavior of a large number of fruit and vegetable varieties. The Beta and Campbell Early grapes produced fruit in 1922. Lists are given of trees, shrubs, vines, and flowering plants suitable for planting in northern Minnesota.

[Horticultural investigations at the Morris, Minn., Substation], P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1922, pp. 49, 50, fig. 1*).—Brief notes are given on the behavior of fruit varieties, including numbered seedlings from the Fruit Breeding Farm at Zumbra Heights.

[Horticultural investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 212 (1924), pp. 9–12, 18–24, 26–28*).—Records taken by G. F. Potter and S. W. Wentworth in the Woodman orchard of Baldwin trees, where soil management investigations have been in progress for over 15 years, showed a distinct gain in growth, as indicated by trunk diameter measurements, in response to fertilizer applications. Contrary to earlier results (E. S. R., 41, p. 43), significant yield increases, approximating 50 per cent, have been recorded in favor of fertilized trees. Furthermore, the unfertilized trees show a decline in vigor, nine trees being dropped in 1922 because of their weakened condition. Production records in 1922 were seriously disturbed by abnormal weather in 1921 and by the depredations of ruffed grouse, which during the winter of 1921–22 stripped large quantities of buds from the trees. Estimates taken following the grouse raids showed a loss of 36.5 per cent of all buds on the side branches and 52.3 per cent from the top branches. In a Baldwin orchard at the horticultural farm an application of 5 lbs. of nitrate of soda per sod-grown tree apparently induced a vigorous, productive condition, equal to the trees of any other treatment.

Studies of the relation of yield to fruit bud formation were continued by Potter, Wentworth, and H. R. Kraybill (E. S. R., 49, p. 741) with spurs gathered during the most active period of fruit bud formation. Those taken from nonfruiting sod plats, 10 per cent of which formed fruit buds, were lowest in total nitrogen; those from fruiting sod plats, none of which formed fruit buds, and those from nonfruiting nitrate plats, 44 per cent of which formed fruit buds, were medium in total nitrogen; and those of the fruiting nitrate plats, 0.5 per cent of which formed fruit buds, were highest in total nitrogen. At the same time the spurs from the nonfruiting sod plats were highest in starch, those from the nonfruiting nitrate plats medium in starch, and those from the fruiting sod plats and the fruiting nitrate plats were lowest in starch.

It is pointed out that some other condition besides high starch and low nitrogen in the spurs must be essential to fruit bud formation, since of two sets of spurs having approximately equal total nitrogen those (sod plat trees) having the greater amount of starch produced the lesser number of fruit buds.

To test the effect of defloration at the pink bud stage on fruit bud formation during the same season, Oldenburg (Duchess) trees were fully and half deflorated in the spring of 1922. Records of bud formation taken the following spring showed 41.4, 10.3, and 9.2 per cent of fruit buds for the fully deflorated, half deflorated, and control trees, respectively. Partial defloration had, therefore, no significant tendency to stimulate annual fruiting.

The discovery of a Wealthy orchard, part of which had been disbudded by grouse, gave opportunity for Potter and H. A. Rollins to study the effect of the injury on production and growth. Records showed that an average of 51±2.2 per cent of the buds had been removed from 11 injured trees. The average percentage of set for the disbudded trees was 71.8±3.2, as compared with 55.5±1.8 for normal trees. The average number of fruits per spur was 2.26±0.02 for the disbudded and 1.95±0.68 for normal trees.

Delicious and Golden Delicious apples are deemed promising as winter varieties of high dessert quality. Stayman is also thought to have possibilities for favorable locations in the State.

In a test by Wentworth of nitrate of soda for the strawberry, no significant differences in yield were recorded regardless of season or size of the application. Runner formation in the strawberry was not influenced by the application of nitrate of soda or acid phosphate but the area of the leaves was increased by nitrate applications.

Trunk measurements of apple trees submitted to different types of pruning showed the greatest increase in trees pruned to the full leader form. The value of nitrate of soda for the peach was indicated in yields obtained in a fertility test in which plats received nitrogen alone or in various combinations, averaging 4 baskets as compared with 2.9 for the check. Diameter increases in the trunk corresponding to yield increases were observed.

In studies by J. R. Hepler nitrate of soda in the absence of manure failed to produce satisfactory yields of squash. On the other hand, acid phosphate at the rate of 1,000 lbs. per acre exerted a stimulating effect on squash production. In the absence of manure, but with 500 lbs. of nitrate of soda, acid phosphate increased squash yields over fourfold. Manure, and more especially chemical fertilizers used alone, were much more effective when placed in the hill under the squash plant. Fertilizer studies with the tomato, carried on by Hepler and Kraybill again showed (E. S. R., 49, p. 234) that acid phosphate has a distinct tendency to hasten the maturity of the fruit. Potash used in combination with phosphoric acid delayed maturity and decreased yield. Selection studies with the tomato by Hepler failed to show positive results in respect to yield, the average production per plant in 1922 and 1923 being greater for the progeny of low yielding than of high yielding plants. In a test of 25 tomato varieties, the early maturing kinds alone produced satisfactory crops.

[Horticultural investigations at the Washington Station], J. L. St. John, O. M. Morris, and R. P. Bean (*Washington Col. Sta. Bul. 180* (*1923*), *pp. 19, 20, 38, 70, 71*).—Studies of the changes occurring in Jonathan apples during the ripening stage up to the time of damage by frost showed a tendency for total acids to decrease, total sugars to increase, and reducing sugars to slightly increase as the fruit developed. Determinations of the H-ion concentration in the juice did not show a progressive variation, although a tendency to decrease was noted.

A continuation of previously noted work (E. S. R., 49, p. 232) on orchard fertilization indicated that nitrogen-bearing fertilizers are of value to clean tilled orchards when the trees are making poor growth. Nonnitrogen-bearing fertilizers were ineffective in the same orchards. No form of fertilizer gave results on soil which had been growing alfalfa or vetch for a period of three or more years. A mulch of wheat straw or alfalfa hay was effective in conserving soil moisture. Of the three legumes, alfalfa, vetch, and field peas, alfalfa was found most popular. However, vetch is recommended for sandy soils, while field peas are considered of little value because of their inadaptability to late spring or early summer planting.

Observations on the effect of liming truck crops in Ohio, R. MAGRUDER (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 175–179*).—The completion of two cycles of a four-year vegetable rotation, (1) sweet corn, (2) cucumbers, (3) cabbage, and (4) tomatoes, carried on in connection with fertilizer studies at Marietta, Ohio, showed that the application of 1 ton of ground limestone per acre each year was profitable in all cases where used alone. Negative results were secured when limestone was used in connection with 16 tons of manure for sweet corn and when used for corn, cucumbers, and tomatoes in connection with 610 lbs. of a 4.2–10.5–4.1 chemical mixture.

Data taken in similar studies at Wooster are not considered of equal significance because of shorter duration. However, the application of 1,000 lbs. of limestone increased cabbage and sweet corn yields in all treatments and reduced tomato production except when used alone. The detrimental effect of limestone when applied in connection with chemical fertilizers is believed to be due to chemical reactions which result in a decreased availability of phosphorus for the affected plants. The different responses of the several crops is believed due to variations in the feeding power for raw rock phosphate. For example cabbage, having a high feeding power for this material, was able to utilize phosphate successfully even in the presence of large amounts of lime.

Premature seeding of celery, C. C. STARRING (*Market Growers Jour., 34 (1924), No. 8, pp. 10, 11*).—Of eight treatments, namely, (1) temperature control, (2) early planting, (3) soil modification, (4) reduction of water before planting, (5) repeated drying in the flats, (6) trimming before setting, (7) trimming in the greenhouse, and (8) early banking, only one, that of temperature control, contributed to the production of seed stalks. Based on three-year averages, plants kept in a cold frame one month previous to field setting showed an increase of 33 per cent of seed stalks for late sown and 57 per cent for early sown seed. Plants grown in the greenhouse where the temperature was held as nearly as possible within a range of 40–50° F. produced 83 per cent more seed stalks with early sown and 54 per cent more with late sown seed than did similar plants held at considerably higher temperatures. Exposure to low temperature (32° F. approximately) for a single night was not sufficient to influence seeding. In comparing early February and early March sowing, no difference in the amount of resulting seed stalks was noted when both lots were kept at warm temperatures. It is suggested that celery should not be hardened by exposure to low temperatures preceding field planting, and in some cases it may be advisable in lack of warm greenhouses to delay sowing until warmer weather prevails.

Studies in sweet corn germination in relation to the effects of moisture content and temperature, C. A. GARNER (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 166–175*).—Microscopic examination of sweet corn kernels and seedlings subsequent to freezing at 0° F. showed little injury to the cell structure whether rapidly or slowly thawed, leading the author to conclude that the death of seedlings and moistened seed was due to physical and chemical disorganization of the protoplasm rather than to cell wall rupture. In dried seeds containing 10 per cent moisture no rupturing was noted. In germination tests of mature and immature sweet corn gathered before and after frosts, the immature frosted material alone showed any injury, indicating that corn in the milk stage is unable to survive frosts. Corn left in the field until early winter was materially injured, and freezing studies with corn of various moisture contents, as obtained by soaking in water for different periods, showed an important relation between water content and injury. In sweet corn practically all seeds containing 50 per cent or more of water were killed, while in field corn the critical moisture content was 70 per cent, indicating that sweet corn is more easily injured than field varieties. A comparison of the rate of absorption of water by dry field and sweet corn showed that sweet corn absorbs water more rapidly, suggesting the need of greater care in storage. Two types of sweet corn kernels were observed, (1) thin wrinkled and (2) plump smooth. Of the two, the latter absorbed water less readily.

Pollination and self-fertility in the onion, H. A. Jones (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 191–197*).—Studies at University Farm, Davis, Calif., indicated that self-pollination of the onion can be accomplished with a minimum of effort by inclosing flower heads in Manila paper sacks and allowing them to be blown about by the wind. Some seed was produced by paper covered heads held stationary by stakes. Although most of the self-pollinized plants were strongly self-compatible, certain individuals displayed a tendency toward sterility. Flower primordia were first observed in dissected Yellow Globe Danvers bulbs on March 2, approximately a month earlier than at College Park, Md. (E. S. R., 49, p. 137). Information is given concerning the flowering performance of the onion.

Pollination studies with greenhouse tomatoes, H. W. Schneck (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 198–206*).—Of five pollination treatments tested for the greenhouse tomato, namely, (1) thumb nail following emasculation, (2) dipping in a watch glass, (3) brushing, (4) jarring the plant ,and (5) none, the first two practices were most effective in all respects in increasing the number, size, and symmetry of fruit and early and total yields. All four artificial treatments gave marked increased production above that of the control plants. Early yield (first four weeks) was influenced more by pollination treatment than was total yield, the range for early yield being from 6.2 lbs. per 100 sq. ft. for check plants to 32.7 lbs. for emasculated plants, as compared with total yields ranging from 62.5 lbs. per 100 sq. ft. for check plants to 123.3 lbs. emasculated plants. The author, in presenting data on the net returns from the various treatments, reports that careful hand pollination was a profitable practice and constitutes a very important factor in the production of greenhouse tomatoes.

[Spray calendars for New Jersey fruits] (*New Jersey Stas. Circs. 162 (1924), pp. 4, fig. 1; 163, pp. 4, figs. 3; 164, pp. 4, figs. 3; 165, pp. 4, fig. 1; 166, pp. 2, fig. 1*).—This series of spray calendars for the apple and quince, peach, pear, plum and cherry, and grape is designed to supersede similar previously noted pamphlets (E. S. R., 49, p. 138).

Factors that influence the effectiveness of peach thinning, A. J. Farley (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 145–151*).—Two factors, (1) seasonal and (2) quantitative, were studied by the New Jersey Experimental Stations in peach thinning investigations conducted in a commercial Carman and Belle orchard located at Bridgeton. In the case of both varieties the largest yields were produced by check trees. However, the production of high grade fruit and, consequently, the gross income per acre were greatly increased as a result of thinning operations. With the Carman variety, a relatively early ripening peach, early season, heavy thinning was the most profitable, while with the Belle the most profitable results were obtained from midseason, light thinning. In discussing the results, the author points out that there is a relatively long period during which either variety may be thinned to advantage. Heavy thinning was more effective than light thinning in increasing the number of large fruits except in the case of the early, heavily thinned Belle trees, where an abnormal crop of young fruit reduced the number of fruit below a profitable number. It is pointed out that varietal and individual orchard conditions should be taken into consideration when making thinning recommendations.

Cross-pollination between the Reine Claude and Burbank plums, L. H. MacDaniels (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 123–127*).—The inclosure at the New York Cornell Experiment Station of a 12-year-old Reine Claude and a 12-year-old Burbank tree in a mosquito net tent containing a hive of bees resulted in a full crop of Reine Claude and a fair crop of Burbank plums, indicating that the two varieties are interfertile. Since attempts to germinate seeds failed except in the case of one Burbank, the author concludes that the varieties are intersterile in the true sense. He suggests that the tendency for Burbank to overbear when planted with other triflora varieties may be overcome by interplanting with domestica varieties, thereby avoiding the expense of thinning the fruits.

Strawberry culture in Wisconsin, J. G. Moore (*Wisconsin Sta. Bul. 360 (1924), pp. 24, figs. 9*).—Directions are presented for the selection of site, preparation of the soil, use of fertilizers, setting plants, cultivation, mulching, harvesting, control of pests, and the choice of varieties. The necessity of cross-pollination of imperfect forms is emphasized.

Citrus cultivation, C. C. Gowdey (*Jamaica Dept. Agr., Ent. Circ. 10 (1924), pp. 10*).—This consists of general information designed for the practical grower.

Progress in pineapple improvement by selection and breeding, R. E. Doty et al. (*Hawaii Univ., Ann. Short Course Pineapple Prod., 2 (1923), pp. 92–110*).—The technique of hybridizing the pineapple is discussed, and certain characters in seedlings which were found to indicate quality or lack of quality are pointed out. Variations were observed in the Cayenne variety, indicating that abnormal forms arise in the pineapple as in other fruits. Statistical data taken on 3,498 plants showed a great range in weight of fruits produced. However, 80.3 per cent fell in the 4- to 6-lb. class, the mean being 5.16. In respect to slips, 18.85 per cent of the plants produced none, the average per plant being 3.4, and two plants reaching a maximum of 23. In respect to top suckers, 60.7 per cent of the plants produced 2 and 20 per cent 3. One plant reached a maximum of 8. Four distinct fruit types are described for the Cayenne variety.

Seven thousand dahlias in cultivation, J. B. S. Norton (*College Park, Md.: Author, 1924, pp. 291*).—An alphabetically arranged list of varieties giving, when possible, the name of the originator, the year of origin, class, color, synonyms, etc.

Gardening in California: A guide for the amateur on the Pacific slope, S. B. Mitchell (*Garden City, N. Y.: Doubleday, Page & Co., 1923, pp. XII+323, pls. 25, fig. 1*).—A popular treatise devoted for the most part to plant material.

FORESTRY.

Better forests for Connecticut, H. W. Hicock (*Connecticut State Sta. Bul. 253 (1924), pp. 129–140, figs. 5*).—In connection with general suggestions for the improvement of farm woodlots and the planting of idle lands to fast growing softwood species, the author discusses the forestry situation in Connecticut, in New England, and in the country as a whole, pointing out the rapid approach of the time when the country must rely on current production rather than upon the accumulated reserves of past centuries. It is emphasized that progress in farm forestry is dependent upon three major factors, (1) the suppression of fires, (2) reduction of taxes on growing forests, and (3) improvement in silvicultural practices.

The windbreak as a farm asset, C. G. BATES (*U. S. Dept. Agr., Farmers' Bul. 1405* (*1924*), *pp. 16, figs. 8*).—This bulletin is a revision of and supersedes Farmers' Bulletin 788 (E. S. R., 37, p. 46).

Northern woodlot trees, J. B. BERRY (*Chicago: World Book Co., 1924, pp.* [*X*]+*214, figs. 106*).—A guide for the identification of important forest trees, presenting, in addition to an anatomical key to the woods, information concerning form of trees, distribution, distinctive characters, and nature and uses of the wood.

The yew, its rôle in silviculture and rate of growth [trans. title], W. JEDLIŃSKI (*Rocz. Nauk Rolnicz., 9* (*1923*), *No. 3, pp. 445–488, figs. 13*).—For centuries the wood of the yew, because of toughness and durability, has been eagerly sought by man, with the result that the genus is slowly disappearing. Under favorable environment the yew tree attains a height of 10 meters (about 33 ft.) and an age of 2,000 years. Examination of the trunk of a tree 114 years old showed that it contained approximately 0.07 cubic meter (2.47 cu. ft.), of which 68.4 per cent was heartwood, 28 per cent sapwood, and 3.6 per cent bark. Height growth at its best approximated 7 cm. (2.76 in.) per annum. This extremely slow development is believed by the author to explain why the yew has never been utilized in silviculture.

Volume tables and form factors for sal (Shorea robusta), S. H. HOWARD ([*Indian*] *Forest Bul. 47* (*1922*), *pp. 8+5, fig. 1*).—Tables are presented based on 817 trees, 442 of which were above a minimum mean diameter of 8 in. over bark at the thin end.

The yield curves of Hevea trees [trans. title], W. H. ARISZ (*Arch. Rubbercult. Nederland. Indië, 8* (*1924*), *No. 2, pp. 73–85, figs. 6*).—Observations on the latex flow of individual Hevea trees indicated marked variability in the occurrence of the rest or wintering period, a stage of the trees' development associated with the putting forth of new leaves and usually characterized by a greatly reduced latex production. Plotted curves showed that the rest period occurs regularly once a year in certain trees, while in others the cycle is completed in longer or shorter periods. Some trees wintered four times during three calendar years. The maximum flows usually occurred subsequent to or just prior to the wintering and were not associated with rainfall conditions. Daily variations in production were insignificant.

[**Forest administration of the Central Provinces for the years 1920–21 and 1921–22**], B. B. OSMASTON and H. A. FARRINGTON (*Cent. Provs.* [*India*] *Forest Admin. Repts., 1920–21, pp. 7+35+CXIII; 1921–22,* [*pt. 1*], *pp. 34;* [*pt. 2*], *pp. LXXV*).—These are the usual annual reports (E. S. R., 46, p. 541), presenting information regarding changes in area and boundaries, protective activities, silvicultural operations, production of lumber, lumber products, grazing operations, and financial returns. The 1921–22 report is presented in two parts, the first relating to general activities and the second comprising tabulated statistical data.

Progress report on forest administration in the Punjab for the year 1922–23, A. J. GIBSON (*Punjab Forest Admin. Rpt., 1922–23, pp. II+*[*52*]*+CLXXXIII, pls. 3*).—The usual annual report (E. S. R., 49, p. 240), presenting general administrative information and statistical data concerning alterations in area, revenues, expenditures, etc.

British Empire Forestry Conference, London, 1920 (*London: Govt., 1921, pp. IX+304*).—This is the official report upon the first British Empire Forestry Conference, held in London in 1920.

DISEASES OF PLANTS.

Department of plant pathology and soil bacteriology, T. F. MANNS and J. F. ADAMS (*Delaware Sta. Bul. 135 (1924), pp. 25–46*).—Following the report of Elliott that soil rot or pox of the sweet potato is due to *Cystospora batata* (E. S. R., 36, p. 544) further studies were made by Manns to confirm this conclusion, but without success. However, inoculation experiments showed that the disease can be readily transmitted. An actinomycete was found associated with it, and this organism is now believed to be the cause of the disease.

A report is given by Adams of inoculation experiments to determine the pathogenicity of *Rhizoctonia* sp. on sweet potatoes, the effect of rotation on the prevalence of soil rot or pox, and the use of inoculated sulphur for the control of soil rot and soil stain. Heavy inoculation with cultures of *Rhizoctonia* sp. gave negative results so far as the experiment had progressed. In the rotation experiments the plowing under of a heavy green manure crop was followed by an increase in the amount of soil rot due, it is thought, to the increased moisture-holding capacity of the soil. Inoculated sulphur reduced the amount of soil rot and soil stain.

Studies of peach yellows and little peach have been continued, and Manns reports the failure to communicate either disease through inoculations made with infusions of leaves, limbs, or fruits from diseased trees. Two years' work on transfer of pollen is thought to indicate that pollen from trees infected with yellows is functionless.

An account is given by Adams of studies of normal wood and wood of peach trees infected with yellows which show that on one-year wood the carbohydrate synthesis of yellows wood is not materially different from that of normal wood. In two-year wood a more pronounced and permanent disposition of gum was manifest in the medullary rays in the case of trees infected with yellows. Studies of leaves indicated a functional derangement resulting in imperfect carbohydrate utilization on the part of diseased trees. The conspicuous morphological difference in the leaf tissue is said to be the underdevelopment of the palisade and spongy parenchyma.

Considerable attention has been given to a study of downy mildew on cucurbits, due to *Pseudoperonospora cubensis*, and Adams has reported symptoms by which downy mildew may be recognized and distinguished from other diseases. These are said to be characterized by the appearance of water spots in the early stages of the disease, followed by a chlorotic condition, and finally the tissue becomes dead.

Experiments for the control of downy mildew on cantaloups are reported in which the plants were dusted with a copper arsenate to which lime and nicotin sulphate were added in different series. A heavy infection of cantaloups is reported, and it was found that control could not be secured by this means under weather conditions favorable to the growth of the fungus. Heavy applications gave no greater advantage than a light, even distribution.

Accounts are given of investigations of diseases of canning peas. For the control of Aphis, nicotin sulphate dust gave satisfactory results, and it is believed that the use of nicotin dust will be practicable where the expense does not average more than $15 per acre. In connection with these investigations a root rot was discovered, and cultural studies revealed the presence of *Fusarium* sp. Another disease characterized by the occurrence of dark brown spots on the lower leaves was observed, and a fungus similar to the leaf blight, *Ascochyta pisi*, was isolated. In cultural characters, however, it does not agree with this fungus, and further investigations are to be made to determine both its pathogenicity and classification.

An investigation is in progress on the diseases of soy beans and cowpeas, and a fungus isolated from the pods of cowpeas in 1921 has not yet been definitely determined. A pod spot on soy beans was found which has been tentatively determined as *Phomopsis* sp., and it is being studied in connection with the recently described *P. sojae* reported from South Carolina. A mosaic disease of soy beans is said to have appeared in various parts of the State, and in some instances the presence of woolly aphis is thought to have been associated with the disease.

Among miscellaneous work reported are spraying experiments in which fruit russeting and leaf burning were observed in connection with the use of Bordeaux mixture, copper lime, arsenate dust, sulphur, lime arsenate dust, and liquid lime sulphur arsenate combination.

[Plant disease investigations of the Georgia Station] (*Georgia Sta. Rpt. 1923, pp. 49, 50*).—In connection with the Fusarium wilt of tomatoes, a line selection of resistant plants has been made and selections planted of seed from self-fertilized plants. Some of the selections have proved quite resistant to disease and are being propagated for further trial.

In continuation of pepper diseases, a report of which has already been noted (E. S. R., 49, p. 346), some additional information is given. More than 20 cultures of anthracnose fungi were isolated from pepper fruits and young seedling plants, and a comparison of the cultures is said to indicate that they represent at least five species, only one of which is actively parasitic.

Some progress was reported on strains of tobacco resistant to root rot.

[Plant disease investigations of the Michigan Station] G. H. Coons (*Michigan Sta. Rpt. 1922, pp. 205, 206*).—Summary accounts are given of investigations carried on during the year covered by this report.

In connection with the study of the life history of certain fungi with reference to means of identification, C. W. Bennett has investigated some white forms developed from cultures of *Phoma apiicola* and has found that those variations which have appeared seem to be attenuated forms without power of fruit body formation. Work with animals in testing biological methods of identification of fungi has not advanced very far, but it is claimed that the fungus cultures used definitely sensitize laboratory animals.

Celery disease investigations carried on by R. Nelson are said to have progressed to a point where a strain of celery has been secured that is resistant to disease. This strain subjected to severe conditions grew normally and developed a marketable crop of celery of good quality, while other varieties failed completely.

In a study of blackleg disease of potato, by J. E. Kotila, rather definite relations have been established between the blackleg organism and *Bacillus carotovorus*. Attenuation of the blackleg organism has also been accomplished. In connection with potato disease investigations, the use of sulphur as a means of scab control gave results that were not favorable to sulphur when applied to calcareous soils.

The author reports briefly on the control of stinking smut of winter wheat and oats with dust fungicide treatments. While there was considerable reduction of smut in wheat the use of dust with oats gave poor results, and the treatment is not recommended for this grain.

In a study of bean diseases, Nelson has worked out a method for the accurate diagnosis of bean mosaic, differentiating this disease from other types of leaf mottling and curling. Bean mosaic is said to be transferred by the agency of *Macrosiphum solanifolii*.

Some investigations were begun on transportational diseases of fruits and vegetables, and as a result of studies of grapefruit, orange, apple, cabbage, lettuce, and potatoes Nelson has found that the breaking down of these products is in the nature of asphyxiation.

[Plant disease investigations of the New Hampshire Station] (*New Hampshire Sta. Bul. 212* (*1924*), *pp. 32, 33*).—In continuation of investigations of snapdragon rust and its control (E. S. R., 49, p. 651), O. Butler reports having found that plants grown in the field can be protected from the rust if they are covered by bell jars at night.

Both dusting with sulphur and spraying with calcium polysulphid were found beneficial for the control of sooty mold.

In experiments for the control of apple scab, less than 0.5 per cent Bordeaux mixture did not give satisfactory control.

Brief summary accounts are given of experiments to determine the effect of spindling sprout on yield of potatoes, the effect of corrosive sublimate treatment for Rhizoctonia control, and the effect of removing net-necrosis tubers on the percentage of leaf roll. Corrosive sublimate as used was found entirely harmless, and the author recommends the addition of an equal weight of common salt to corrosive sublimate, as this hastens the solution very materially. Spindling sprout tubers were selected from seed placed to green in diffuse light. The sprouts were removed and the tubers planted. The stand obtained was nearly perfect, but 93.5 per cent showed symptoms of leaf roll. The tubers produced were mostly of nonmarketable size. A random selection of samples of Green Mountain potatoes, in which about 20 per cent of the tubers showed net-necrosis, were planted, and from the tabulation of the yields it appears that leaf roll can be reduced by eliminating tubers affected with net-necrosis. If net-necrosis is present in a large percentage of tubers, the author recommends that such stock should not be used for planting purposes.

Division of plant pathology, F. D. HEALD (*Washington Col. Sta. Bul. 180* (*1923*), *pp. 40–48*).—Tests are reported of various dust fungicides for the control of wheat smut, *Tilletia tritici*, comparisons being made with the standard formaldehyde treatment. All dust treatments reduced the percentage of smut to a greater degree than formaldehyde. Copper carbonate, used at the rate of 3 oz. per bushel, gave better control than where 2 oz. were used. Several trade preparations were found to be effective in reducing smut, and comparisons of different brands of copper carbonate failed to show any material differences where equal amounts of copper were used. The additions of forms of lime to anhydrous copper sulphate did not give as good control as where copper carbonate was used. Nickel carbonate was found to be inferior to copper carbonate, and furfural gave no control. Head counts of smut were not found a reliable measure of the reduction of yield due to smut.

Dates of seeding, varietal susceptibility, and the effect of fertilizer applications were tested in connection with foot rot of wheat, and late (October and November) seeding showed the lowest percentage of fallen culms. Considerable differences in susceptibility were shown in a test of 32 varieties of wheat. No variation in the amount or degree of infection was observed in the fertilizer plats.

In experiments for the control of oat smut, *Ustilago levis*, the seed was artificially smutted and then treated with copper carbonate, comparisons being made with formaldehyde treatment. Practically all the treatments reduced smut completely.

The effect of treating sclerotia infested potato tubers with corrosive sublimate was tested, and in potatoes grown from tested seed tubers the crop was 96.55 per cent free from sclerotia. Where the seed tubers were selected as free from sclerotia and treated, 100 per cent of the crop was clean. Copper carbonate dusted on the tubers after cutting gave no control, nor did Corona Compound give as good control as corrosive sublimate.

In connection with the study of foliage diseases of the potato, leaf roll, two kinds of mosaic, streak, and spindling tuber are reported to be widespread in the State.

An investigation was begun in 1923 to study the effect of winter injury of fruit crops, and the author reports the presence of a wound parasite (*Stereum purpureum*) which increased the intensity of winter injury in the Spokane Valley.

A survey is reported of one of the prominent onion-growing districts of the State. A Fusarium rot of onion was found prevalent. This disease exhibits characters very similar to pink root which is attributed to *F. malli* (E. S. R., 40, p. 643). Studies are in progress to determine the identity of the fungus in question.

Notes are given on a number of diseases observed in the State for the first time, and others reported on additional host plants.

Smut treatment, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 29, 30*).—On account of the reputed injury by formaldehyde when used for the treatment of cereals for the prevention of smut, a comparative test was made of formaldehyde, chlorophol, Seed-O-San, and copper carbonate for the control of smut in wheat, oats, and barley. As a result of one year's trial, formaldehyde was found the most effective for the control of smut in either wheat, oats, or barley. The yields, however, of wheat and oats were somewhat less on the formaldehyde plats than on the others. Chlorophol proved an effective control for smut with no reduction in yield. The two powders, Seed-O-San and copper carbonate, were not found so effective as the liquid treatments.

Effect of delayed planting on germination of seed wheat treated with formalin, H. Braun (*Phytopathology, 12 (1922), No. 4, pp. 173–180, pl. 1, figs. 3*).—The present paper is a partial report on a series of experiments conducted to determine the effect of delayed planting on the germination of seed wheat treated with formalin by the ordinary method and by the presoak method previously described by the author (E. S. R., 43, p. 844).

The hardening effect of persistent formaldehyde or its polymer on the pericarp is counteracted in the presoak method by the softening of seed tissues through previous absorption of water vapor. Formaldehyde or its polymer does not persist on presoaked formalin-treated seeds to the same degree as on seeds treated without presoaking. The experiments of the author are said to indicate that presoaked formalin-treated seed wheat may be held for several days or even a week before planting without appreciable injury to germination.

Some observations on alfalfa girdle, J. G. Brown and F. Gibson (*Phytopathology, 12 (1922), No. 4, pp. 188–190, pl. 1*).—A report is given of a rather serious disease of alfalfa in Arizona, the symptoms of which were previously reported by McCallum (E. S. R., 23, p. 646). In that report the disease was attributed to a species of Phoma. Similar injuries have been described as caused by various insects. In the present paper the authors state that the first visible sign of the disease is a slightly sunken band of a light green color on the stems, which widens and becomes grayish green. The leaves at first are purplish and later turn yellow above. The stems may become purple or reddish green.

In addition to alfalfa 12 other species of plants have been found girdled in a similar manner, and in one a scale insect was associated with the injury. It is thought probable that the scale is connected with the disease as a carrier of the organism. Studies made of diseased tissues have shown the presence of fungi and bacteria and from cultures there have been isolated a species of Alternaria, a Fusarium, and a bacterium whose nature has not yet been determined.

Black rot of carrots caused by Alternaria radicina n. sp., F. C. MEIER, C. DRECHSLER, and E. D. EDDY (*Phytopathology, 12 (1922), No. 4, pp. 157–166, pl. 1, figs. 2; abs. in Phytopathology, 12 (1922), No. 1, p. 49*).—A description is given of the storage rot of carrots caused by *A. radicina* n. sp.

The trouble as it occurs on the root is characterized by a softening and blackening of the tissues. Inoculation experiments have shown that under favorable conditions the fungus may infect the foliage, causing a spotting and wilting of the leaves. The authors consider that *A. radicina* may be regarded as a facultative parasite of undoubted vigor affecting mature tissues, particularly those more or less bruised or wounded while being harvested, or those in storage.

Corn rot investigations, C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 30, 31*).—A brief account is given of investigations carried on to discover the prevalence and importance of corn root rot in the Red River Valley of Minnesota. Several hundred ears of different varieties of corn were tested for germination, and where evidences of rot appeared the grain was planted in comparison with ears showing no disease infection. As a result of this experiment there was in every instance a higher yield per acre of corn from the diseased seed than from the disease-free seed.

Corn root rot, B. B. BRANSTETTER (*Missouri Sta. Circ. 117 (1924), pp. 8, figs. 4*).—A popular account is given of the corn root rot, which is said to be quite serious in some localities, and suggestions are given for its control. Recommendations consist of a selection of good seed corn and the adoption of cropping systems in which corn is not planted in the same field for more than two years in five. Proper fertilization and liming of the soil are also considered as having an important bearing on this disease.

The black-bundle disease of corn, C. S. REDDY and J. R. HOLBERT (*Jour. Agr. Research [U. S.], 27 (1924), No. 4, pp. 177–206, pls. 6, figs. 4*).—In connection with studies of corn parasites the authors have given an account of investigations of what is termed "black-bundle" disease of corn. This is characterized by the presence of blackened vascular bundles in the stalks and sometimes in the leaves. Associated with the disease are said to be the following abnormalities: Excessive sucker production, prolific stalks, manifestations of which are a tendency for ear development at many nodes or multiple-ear production at one node; a type of reddening or purpling of the leaves and stalks; stalks with aborted ears; and stalks bearing nubbins only. Closely associated with these symptoms the authors have found *Cephalosporium acremonium*, and pure culture inoculations of the fungus have produced many of the symptoms. The disease, which is seed borne, is considered due to this organism. To reduce losses from this disease it is recommended that seed selection be made of seed ears from stalks not showing any of the group of symptoms. Preliminary seed treatment experiments are said to be promising for the control of the disease.

New facts concerning diseases of vegetables and their control, G. P. CLINTON (*Conn. Veg. Growers' Assoc. Rpt. 1921, pp. 7–20*).—This account of investigation of vegetable diseases includes bean anthracnose, rust, bacterial blight (*Bacterium phaseoli*), yeast disease, and bacterial leaf spot; cabbage clubroot, blackleg, black rot, and yellows (*Fusarium conglutinans*); celery bacterial leaf spot, Phoma root rot (*P. apiicola*), yellows (*Fusarium* sp.), soft rot or bacteriosis (*Bacillus carotovorus*), and late blight; cucurbit bacterial wilt, angular leaf spot (*Bacterium lachrymans*), and mosaic; eggplant blight (*Phomopsis vexans*); horse-radish root rot (*Bacillus carotovorus*); lettuce downy mildew, mosaic, and Sclerotinia rot (*S. minor* or *S. libertiana*?); onion smudge or black spot, smut (*Urocystis cepulae*), pink root (*F. malli*), and *Macrosporium* spp.; pea blight (*Pythium* sp.?) and anthracnose (*Colletotrichum pisi*); rhubarb root rot (*Phytophthora* sp.); tomato blight (*Phytophthora* sp.), wilt (*F. lycopersici*), leaf spot (*Septoria* sp.), streak, and mosaic; and turnip mosaic.

Investigations of cauliflower diseases on Long Island, E. E. Clayton (*New York State Sta. Bul. 506 (1924), pp. 3-15, pls. 8, figs. 1*).—Descriptions are given of a black rot of cauliflower due to *Pseudomonas campestris*; whiptail, attributed to unfavorable soil conditions; blackleg, *Phoma lingam*; clubroot, *Plasmodiophora brassicae;* peppery leaf spot, *Pseudomonas maculicolum*; and Alternaria leaf spot, *A. brassicae.* Of these diseases, black rot and whiptail are said to be very destructive, blackleg and clubroot only moderately troublesome, while the other diseases commonly do little damage. Black rot and blackleg are said to be seed borne, while the other organisms live over winter in the soil. Black rot is spread mainly by insects, the others by rain, wind, and cultivation.

Seed treatment is said to have given control of black rot and blackleg, the hot water treatment being more effective than corrosive sublimate. Treating the plants in the seed bed with corrosive sublimate solution gave good control of black rot and blackleg, and it was also found effective against clubroot. Liming the soil effectively controlled whiptail.

Bacterial infection of cotton bolls, E. Ballard and D. Norris (*Agr. Jour. India, 18 (1923), No. 1, pp. 40-49*).—A shedding of bolls from Cambodia cotton (*Gossypium hirsutum*) in 1919-1920, accompanied by a discoloration of the bolls and seeds and often of the lint, which showed also a slimy and rotten appearance, led to a study of the matter in 1921.

The rotting and premature fall of tender cotton bolls appears to be largely because of a bacterial disease which is not due to *Bacterium malvacearum.* Angular leaf spot has not been found in the district under observation. No fungus was found associated with the disease in its early stages. Insects appear to play a prominent part in the dissemination of the disease by affording a ready means of entrance. The two which may be concerned in the spread of the disease are *Ragmus morosus* and *R. flavomaculatus.*

The organism considered responsible grows readily on a variety of culture media and produces moist whitish translucent colonies on agar cotton boll extract medium.

Potato diseases, R. W. Goss (*U. S. Dept. Agr., Dept. Circ. 289 (1924), pp. 22, 23*).—In a study of the comparative pathogenicity of different strains of *Fusarium oxysporum* under both irrigated and dry land conditions, the author found that there were different degrees of pathogenicity in the strains tested. Practically no typical wilting of the plants was produced with any of the methods of inoculation or strains of organisms used. The largest amount of infection was found on potatoes grown under dry land conditions. In connection with this investigation an unidentified species of Fusarium was found which appears capable of producing a high percentage of wilted plants under all conditions of the experiments.

Michigan potato diseases, G. H. Coons and J. E. Kotila (*Michigan Sta. Spec. Bul. 125 (1923), pp. 3-55, figs. 48*).—This bulletin gives descriptions of many of the more serious diseases of potatoes known to occur in Michigan, the information being arranged according to methods of control for the different troubles.

Occurrence of phloem necrosis in leaf roll tubers, E. ARTSCHWAGER (*Phytopathology, 12 (1922), No. 4, pp. 193, 194*).—Observations by the author are said to show that phloem necrosis in stolons and tubers of potato plants affected with the leaf roll disease is of wide distribution, and that often the symptoms are more pronounced than those occuring in the lower aerial stem.

Seed potatoes and Rhizoctonia control, R. P. BEAN (*Washington Col. Sta. Bul. 180 (1923), p. 71*).—The effect of treating Rhizoctonia infested potato tubers with corrosive sublimate and the relation of successive dates of planting to the incidence of disease were investigated at the irrigation substation. Where clean tubers treated with corrosive sublimate were planted the clean crop was increased from 91.9 to 97.6 per cent, and where infected seed was treated the increase of clean tubers was from 53.9 to 94.6 per cent. The percentage of infection is said to have decreased uniformly for each successive date of planting.

[Potato] strains and scab control, L. M. BENHAM (*Conn. Veg. Growers' Assoc. Rpt. 1921, pp. 20–25*).—Experimentation on an increasing scale during 1919–1921 is detailed as carried out with south Jersey seed potatoes. Scab seems to be increased by the use of sodium nitrate, bone phosphate, wood ashes, and lime, and to be decreased by ammonium sulphate and acid phosphate. Variety tests are detailed.

Notes on the etiology and specificity of the potato tipburn produced by Empoasca mali, J. R. EYER (*Phytopathology, 12 (1922), No. 4, pp. 181–184, pl. 1, fig. 1*).—The author has made a report on investigations on the potato tipburn caused by the feeding of the potato leafhopper, and has confirmed the statement of Ball regarding the relation existing between the leafhopper and the potato plant (E. S. R., 41, p. 847).

It was found that a tipburn of the potato plant was produced by an extract made from macerated leafhoppers of the species *E. mali* and is transmissible by direct inoculation. The active principle of the extract is said to be most virulent in the nymphal stage of the leafhopper. The specific cause of tipburn was found present in diseased leaf tissue after infection by the leafhopper and was transmitted to the healthy plants by reinoculation. The substance is said to be specific, and the disease has not been simulated by inoculation with extracts from or by direct feeding of insects other than *E. mali*, or by mechanical injury. Sunlight is said to be an important factor in the progress of tipburn after its inception.

The relationship of the species of Fusarium causing wilt and dry-rot of potatoes in western India, S. L. AJREKAR and M. N. KAMAT (*Agr. Jour. India, 18 (1923), No. 5, pp. 515–520, pl. 1*).—Following investigations carried on by Mann and others (E. S. R., 50, p. 247), a wilt and a dry-rot of potatoes were reported. Studies by the present authors have seemed to confirm the view that these two manifestations of disease are due to a different species of Fusarium, and the present report strengthens that opinion as regards both morphology and physiology. The organisms are said to differ as regards spore measurements, growth form, temperature relations, and the nature of the rot produced by each on the potato tuber.

The mosaic disease of sugar cane in India, J. F. DASTUR (*Agr. Jour. India, 18 (1923), No. 5, pp. 505–509, pl. 1*).—A short account is given of sugar cane mosaic as noted at Pusa since its appearance there on the canes D99 and Sathi 131 in 1921, other parts of India and other canes remaining free from the disease so far as noted. Nothing is known regarding the origin or introduction of the disease.

Root disease of sugar cane in Java [trans. title], J. KUYPER (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1923, No. 4, pp. 117–161, figs. 2; abs. in Agr. Jour. India, 18 (1923), No. 5, pp. 536–538*).—In this monograph on sugar cane root disease in Java, with special reference to the seedling cane EK 28, the best variety now planted on that island, it is stated that no causal organism has been identified. Careful study has been made of matters associated with the appearance of the trouble, and it seems that anaerobic conditions, especially when due to bad drainage or excessive irrigation, are very favorable to the disease, especially when cane plant residues are abundant in the soil. This observation favors a 3-year as opposed to a 2-year rotation. Variation and rapid change in soil water content apparently favor the disease. Soil sickness and organic poisons are not emphasized. The disease appears not to be spread by the seed canes. Ripe cane, which is more or less attacked by putrefying organisms promoting anaerobic conditions, tends to develop root rot.

Spread of the disease has not kept pace with the increase in the planting of the very susceptible variety EK 28. Climatic conditions appear very influential. Correction of conditions is urged as regards drainage, cultivation, and irrigation.

On the anatomy of the sweet potato root, with notes on internal breakdown, E. ARTSCHWAGER (*Jour. Agr. Research [U. S.], 27 (1924), No. 3, pp. 157–166, pls. 4, figs. 6*).—As a result of a study of the structure of the edible portion of the sweet potato, the author confirms the claim that it is a fleshy root. The peculiar structure is said to be due partly to the action of a primary cambium, partly to the development of secondary cambiums and their products.

In connection with this investigation a study was made of the condition of sweet potato roots in storage, which is called breakdown. The cells of the interstitial parenchyma of certain of the varieties were found to break down in storage, causing the formation of polyhedral chambers lined with the cottony débris of the disintegrated tissue.

Isaria rot of tomato fruits, F. J. PRITCHARD and W. S. PORTE (*Phytopathology, 12 (1922), No. 4, pp. 167–172, pl. 1, fig. 1*).—A fruit rot of tomatoes caused by *I. clonostachoides* n. sp. is described. The authors report that it has been observed quite frequently in the vicinity of Washington, D. C., during the years 1919–1921. Fruits affected by this rot are usually partly covered by a white cottony surface growth that later becomes pink or pale orange and granular. Sometimes the surface filaments are coarse and occasionally of a greenish-yellow color, but in a dry atmosphere they may become inconspicuous or even absent.

As the fungus produces innumerable spores and infects both green and ripe fruits, the authors believe it will be capable of causing considerable damage.

Winter injury of apple roots (*New Hampshire Sta. Bul. 212 (1924), pp. 13, 14*).—A report is given of experiments conducted by G. F. Potter to determine the effect of environmental conditions on injury to apple seedlings by low temperatures. Field observations and some laboratory work are said to have inindicated that the roots of apple trees are more likely to be killed by cold in winter in a dry soil than in one that is partly saturated with water. The author placed 33 lots of seedling roots in cylinders of sand containing different amounts of moisture and subjected them to a freezing temperature of —8° C. for 9 hours. An examination of the roots showed about 13 per cent less injury in dry sand than in either the wet or medium moist sand. Records of the rate of fall in temperature within the cylinders indicated that the temperature drops most rapidly in the dry sand, and in a cold snap of short duration moist sand or soil would never get so cold as that with a low moisture content. This is thought to indicate that the greater injury to the roots of trees in dry soil is due to the fact that under exposure to a given low air temperature dry sand would ordinarily become much colder than moist sand.

Twenty freezing tests were also carried on to secure additional data on the relation of the rate of freezing to injury to apple seedlings. In this experiment seven lots of roots were frozen in air, the temperature of which was controlled to fall 1.25° per hour. In comparison, seven lots of roots were placed in an atmosphere at —8° and maintained at this temperature for a period long enough so that the entire root reached the temperature of the air, while other lots were lowered to —8° in from 20 to 30 minutes. Roots subjected to the slow rate of freezing showed injury of less than 70 per cent, while those frozen rapidly showed injury of approximately 94 per cent.

A study was made of the effect of size of root on winter injury, in which it was found that there was no greater tendency of small roots to injury than of large ones.

Observations on frost protection and drought spot of apple, J. F. Adams (*Phytopathology, 12 (1922), No. 4, pp. 184–187, fig. 1*).—A report is given of observations on an apple orchard in which protection from frost was obtained by smudge from charcoal furnaces nearby. A long period of drought occurred during the first half of the growing season, and the fruit of the variety York Imperial is said to have shown much drought spot. The effect on the fruit is described at length. Considerable difference was found in the reaction of varieties to conditions of drought, the York Imperial being the most seriously affected of those observed.

Varietal susceptibility of the Yellow Bellflower apple to cedar rust, E. F. Hopkins (*Phytopathology, 12 (1922), No. 4, pp. 190–192, fig. 1*).—The author reports the Yellow Bellflower apple as especially susceptible to infection by *Gymnosporangium juniperi-virginianae* in Missouri.

Control of brown-rot of prunes and cherries in the Pacific Northwest, D. F. Fisher and C. Brooks (*U. S. Dept. Agr., Farmers' Bul. 1410 (1924), pp. 11+13, figs. 15*).—A popular description is given of brown rot due to *Sclerotinia cinerea*, which is said to occasion considerable loss in the prune and cherry orchards in Washington and Oregon.

[Fungus diseases of cranberries], D. J. Crowley (*Washington Col. Sta. Bul. 180 (1923), pp. 74*).—A brief report is given of storage tests with cranberries in which it was found that a large percentage of the storage rots of this fruit was caused by *Fusicoccum putrefaciens*, *Sporonema oxycocci*, and *Phomopsis* sp. A number of other organisms were found responsible for a smaller amount of storage losses.

Report on [citrus canker] eradication work in cooperation with the Bureau of Plant Industry, U. S. D. A., for quarter ending September 30, 1923 (*Fla. State Plant Bd. Quart. Bul., 8 (1923), No. 1, pp. 28*).—Following the publication of a previous report (E. S. R., 49, p. 547) one to three citrus canker infections per month were discovered, concluding with June, 1923, after which none had appeared up to September 30, 1923 (see below).

Field work in Florida during the year on disease control, G. F. Weber (*Fla. State Plant Bd. Quart. Bul., 8 (1923), No. 1, pp. 1–8*).—Since the completion of the report noted above, citrus canker (*Bacterium citri*) appeared in an isolated case in October, 1923. The causal organism has been studied in the laboratory.

The report on disease control in the field deals with citrus fruit melanose (*Phomopsis citri*), which is controlled by a Bordeaux oil emulsion applied at certain periods of development of the fruits, scab (*Cladosporium citri*), green spot (rupture of oil cells), and seed bed damping-off (*Rhizoctonia* sp.); cantaloup downy mildew (*Pseudoperonospora cubensis*) and anthracnose (*Colletotrichum lagenarium*); celery pink root (*Fusarium* sp.), blackheart (physiological), and early blight (*Cercospora apii*); coconut palm wilt (*Pythium* sp.); cotton wilt (*F. vasinfectum*); cucumber downy mildew (*Pseudoperonospora cubensis*) and angular leaf spot and rot (*B. lachrymans*); eggplant leaf spot and fruit rot (*Phomopsis vexans*); fig rust (*Physopella ficus*) and leaf blight (*R. microsclerotia*); grape black rot (*Guignardia bidwellii*) and downy mildew (*Plasmopara viticola*); oat crown rust (*Puccinia coronata*); English pea powdery mildew (*Erysiphe polygoni*); potato late blight (*Phytophthora infestans*); sweet potato mosaic (?); sugar cane mosaic; tobacco black shank (*P. nicotianæ*); tomato nailhead rust (*Macrosporium solani*); and a lumber rot (*Poria incrassata*).

Report on [citrus canker] eradication work in cooperation with the Bureau of Plant Industry, U. S. D. A., for quarter ending December 31, 1923 (*Fla. State Plant Bd. Quart. Bul., 8 (1924), No. 2, pp. 74*).—The one infected tree mentioned in the field work referred to above completed a total of 11 citrus trees found infected with canker during 1923.

The operations against the bud rot of palmyra palms on the east coast, W. McRae (*Agr. Jour. India, 18 (1923), No. 5, pp. 487–500, pl. 1*).—An account in some detail is given of attempts to combat palmyra palm bud rot in portions of India subsequent to its first known development to an epidemic degree between 1890 and 1905.

So far as they have gone, the operations can be said to have reached a considerable measure of success, but much still depends on efforts during the next few years to estimate the benefit that has accrued in the reduction of the disease.

Decay of Brazil nuts, E. R. Spencer (*Bot. Gaz., 72 (1921), No. 5, pp. 265–292, pls. 5, figs. 3*).—Brazil nuts obtained during 1919–20 from two wholesale firms in Chicago and from retail grocery stores in Champaign and Urbana, Ill., were examined for diseases said to be responsible for the spoiling of from 10 to 25 per cent of such nuts shipped into the United States during 1919.

The methods employed, which are outlined, showed the presence of black crust, associated with *Pellioniella macrospora* n. sp. on the endosperm of *Bertholletia nobilis* and *B. excelsa;* of white mold, with *Cephalosporium bertholletianum* n. sp. on radicles in the same species; of shell dry-rot, with *Fusarium* sp.; of decays associated with *Aspergillus* sp., bacteria (undetermined), *Actinomyces brasiliensis* n. sp., and *Phomopsis bertholletianum* n. sp.; and of a bitter rot (*Myxosporium* sp.).

A bacterial blight of gladioli, L. McCulloch (*Jour. Agr. Research [U. S.], 27 (1924), No. 4, pp. 225–230, pls. 2*).—A description is given of a bacterial disease which is said to be capable of causing serious injury to the leaves of the gladiolus, and consequently it interferes with the development of the corms. The lesions are said to be more or less angular, translucent spots. From the infected tissues there is a rather copious and viscid exudate which when dry forms a thin, brittle layer or small drops over the surface. The leaves are often coated with soil particles which have become embedded in the exudate.

From diseased material the author has isolated an organism which is named *Bacterium gummisudans* n. sp. A technical description of the organism is given.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Report of the section of entomology [of the Michigan Station], R. H. PETTIT (*Michigan Sta. Rpt. 1922, pp. 211–214*).—This deals briefly with the occurrence of and work with insect pests of the year in Michigan.

Fourteenth report of the State entomologist and plant pathologist, 1922–23, W. J. SCHOENE (*Va. State Crop Pest Comn. Quart. Bul., 5 (1924), No. 4, pp. 28, figs. 6*).—This report includes a discussion of the occurrence of the boll weevil in Virginia and the Mexican bean beetle, the injury to wheat by the grain moth, and a brief report of the investigation of injurious insects, including the codling moth, melon beetle, oriental peach moth, woolly aphid, rose chafer, rosy aphid, cotton worm (*Alabama argillacea*), flea beetles, etc. A brief account of a Comparison of Spray Mixtures as Destroyers of Aphid Eggs, by C. R. Willey (pp. 27, 28), is appended. The boll weevil, which first reached Virginia during the summers of 1921 and 1922, has appeared in Pittsylvania, Nansemond, and Brunswick Counties. The Mexican bean beetle (*Epilachna corrupta* Muls.) first appeared in Lee County in the autumn of 1922.

[Report of the Washington Station] division of entomology, A. L. MELANDER (*Washington Col. Sta. Bul. 180 (1923), pp. 26–29*).—The author reports briefly upon immunity of insects to sprays, based upon Bulletin 174, previously noted (E. S. R., 49, p. 452); the toxicity of arsenicals; leaf roller investigations, the details of which are given in Bulletin 172 (E. S. R., 48, p. 553); soil treatment for subterranean insects; and oil sprays.

Studies of the toxicity of arsenicals conducted in field practice at Dishman, in the Spokane Valley, in 1922 and as insectary studies at Pullman are briefly reported upon. The results obtained in field tests on Winesaps are given in tabular form.

"Outdoor experiments near Toppenish in a field heavily infested with wireworm showed that the insects were attracted to baits during June and that they showed little response during July. Doughs made with rice flour or graham flour or bran proved very attractive. The addition of sugar, oranges, lemons, etc., added little to the drawing power of the baits. Potatoes and carrots were of mediocre value and apples of little worth in attracting wireworms. Mixing poison with the baits proved to be utterly unsuccessful even with caged wireworms. Soil fumigants administered to the baits after wireworms had congregated proved of varying worth, gasoline giving greatest promise, carbon disulphid next, with solutions of calcium cyanid or sodium cyanid fairly effective and cyanamid completely harmless."

In spraying experiments on San José scale at Clarkston during the spring of 1923, "lubricating oil emulsions at 2 per cent proved to be too weak for reliance, 4 and 6 per cent giving almost perfect results. This oil spray applied during August at 2 per cent strength to apple, peach, and apricot produced no harm to the trees; on apple even at 4 and 6 per cent it caused no visible harm. Lubricating oil for gasoline engines was difficult to emulsify and correspondingly gave no control of scale. A homemade emulsion from old crank case oil was efficient at 4 per cent. Of the proprietary sprays used at 6 per cent strength, Dormoil, Spramulsion, and Dormant Soluble Oil gave efficient results. Ortho Crude, even at 12 per cent, was ineffective, as was also Ortho Distillate at 6 per cent and Keresol at 10 per cent. Spurgeon's spray, even at 8 per cent, possessed almost no killing power. Lime sulphurs, as usual, were slow to kill and permitted nearly all of the fruit to become encrusted with scale during the season. Dustan's oil, locally manufactured from unrefined distillate, had little killing value at the concentrations employed."

Sprays for San José scale and leaf roller, A. L. Melander (*Washington Col. Sta. Pop. Bul. 126 (1924), pp. 3–14, fig. 1*).—This is a popular account based upon investigations reported in Bulletins 172 and 174 (E. S. R., 48, p. 553; 49, p. 452).

Cranberry investigations in Pacific County, [Wash.], D. J. Crowley (*Washington Col. Sta. Bul. 180 (1923), pp. 73, 74, 75*).—A loss reaching as high as 50 to 75 per cent of the crop of many growers was caused by the fireworm. Efficient control was not obtained by spraying with nicotin sulphate at a strength of 1 part nicotin to 800 parts of water, while excellent results were secured on the experimental plats which were sprayed at a rate of 1 part of nicotin to 400 parts of water. The tussock moth was the source of some injury, and considerable damage was done by *Otiorhynchus ovatus* and *O. sulcatus* through their girdling the vines and eating the small roots.

Plants tested for or reported to possess insecticidal properties, N. E. McIndoo and A. F. Sievers (*U. S. Dept. Agr. Bul. 1201 (1924), pp. 62*).—This is a report of work conducted cooperatively by the Bureaus of Entomology and Plant Industry, much of the data being presented in tabular form.

The authors report that of 260 species of plants catalogued only about 5 per cent furnish material for efficient insecticides, and of these only about half may be regarded as satisfactorily efficient. "The latter include three species of Chrysanthemum (*C. cinerariaefolium*, *C. coccineum*, and *C. marschallii*) used for making pyrethrum or insect powder, two species of Derris (*D. elliptica* and *D. uliginosa*), and a Peruvian plant known locally as 'cube.' The extracts of these, combined with soap, proved to be promising contact insecticides and compete favorably with nicotin sulphate in efficiency and probably in cost. Relative to the other species catalogued, most of them are not worth further consideration. It does not seem at all probable that satisfactory insecticides can be obtained from the commoner weeds or flowers or from plants known to be only slightly poisonous to man or other animals, but with regard to the poisonous plants, particularly the fish poisons found in the Tropics or subtropics, the chances to obtain other efficient insecticidal material are very promising."

A bibliography of 95 titles and an index of botanical and common names of plants catalogued are included.

Calcium cyanid, W. Moore (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 104–106*).—This is a discussion of the methods of manufacture, the chemical composition, and the reactions which make this compound a promising insecticide.

Factors affecting damage to crops by insects, R. L. Webster (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 54–59*).—This is a brief discussion of the subject.

Notes on the life history of a beneficial reduviid, Sinea diadema (Fab.), Heteroptera, P. A. Readio (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 80–86, figs. 12*).—The author reports studies of the biology of this predacious hemipteran, which is of considerable importance as a beneficial insect.

The gipsy moth problem in New York State, E. P. Felt (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 64–67*).—The author calls attention to the discovery of the gipsy moth in small numbers near or on most of the eastern border of New York State and the necessity of preventing its establishment in the proposed barrier zone some 25 miles wide and extending from Long Island Sound north to the Canadian border.

A preliminary note on the estimation of loss by bollworms, Ibrahim Bishara (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 39 (1924), pp. 22, pls. 6*).—This account, the details of which are presented in chart and tabular form, is based upon investigations of loss in quantity of cotton from the attack of bollworms, conducted in various parts of Egypt during the last five years.

The occurrence of the tortricid Cacoecia rosana L. in Canada, A. Gibson (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 51–54*).—This lepidopteran, first recorded as a pest in eastern Canada in 1919, when it occurred in destructive numbers attacking particularly the foliage of bush fruits in the Province of Nova Scotia, has since been found in destructive numbers in British Columbia. The author presents notes on the eggs, larval, and pupal stages, its parasites, and artificial control.

Biology of the Angoumois grain moth.—Progress report, P. Simmons and G. W. Ellington (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 41–45*).—Records taken by the authors indicate a possible minimum life cycle of about five weeks in hot weather when infesting newly harvested wheat. As many as 283 eggs may be laid. Under certain conditions the availability of drinking water affects the egg-laying powers of the females.

Control of the codling moth in the Pacific Northwest, E. J. Newcomer, M. A. Yothers, and W. D. Whitcomb (*U. S. Dept. Agr., Farmers' Bul. 1326 (1924), pp. II+27, pl. 1, figs. 19*).—This is a practical account, with descriptions of the various stages of the codling moth, a description of its life history and habits, and detailed spraying instructions. An account of combination spraying for the codling moth, powdery mildew, and scab, prepared in cooperation with D. F. Fisher, is included.

The oriental peach moth in Virginia, L. A. Stearns (*N. J. State Hort. Soc. News, 5 (1924), No. 1, p. 77*).—This is a summary of a paper presented at a meeting of the New Jersey State Horticultural Society at Trenton, in January, 1924, in which the present status of this pest in Virginia is briefly considered.

It is stated that at the present time the infested area embraces about 1,000 square miles and comprises some 8,700 acres of orchard, or between 2 and 3 per cent of the total commercial acreage of the State. The moth is causing serious injury in the many small and uncared-for back-yard plantings in a section immediately adjoining the District of Columbia, but it has been doing surprisingly little damage in the few large and well cared-for commercial orchards in close proximity thereto, as the spray treatments regularly applied in these orchards appear to be providing adequate control. It is stated that the early and midseason varieties up to and including Elberta, which ripen in northern Virginia between late July and early September, and constitute 73 per cent of the commercial crop of the State, are comparatively exempt from attack by the pest, since almost one-half of the potential infestation of the season occurs after mid-August. Experiments have shown that nicotin sulphate is decidedly toxic for the eggs of this moth, and that the addition of this material to the regular treatments on peach increased the spray efficiency against this pest from 9 to 14 per cent. Where the combined spray is applied to trees carrying a bushel crop or greater, in the presence of a probable fruit loss varying from 5 per cent for a 3-year-old tree to 20 per cent for a 10-year-old tree, there should be a return of from 9 to 14 per cent over and above the additional cost in spray material.

European corn borer (*New Hampshire Sta. Bul. 212 (1924), pp. 14–16*).—A brief account is given of investigations of the life history of the European corn borer under New Hampshire conditions. It was definitely established that in the locality of Durham the European corn borer can complete two generations in a year.

Research projects and a synopsis of results in European corn borer work, D. J. Caffrey (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 112–117*).—"Investigations of the European corn borer, *Pyrausta nubilalis* Hubn., have shown that as a supplement to the utilization or destruction of infested plants, a system of varietal selection, plus a proper planting schedule and the thorough plowing under of infested crop remnants and weeds, especially during the late autumn, are very effective cultural practices in combating the corn borer. The tendency of the larvae to migrate from their host plant when roughly handled or imperfectly plowed under and the ability of such larvae to hibernate successfully with only a slight amount of protection renders it necessary to utilize or destroy infested material with the minimum amount of handling and to plow under deeply and cleanly. In areas of two generation occurrence, weeds are found infested, even under conditions of sparse infestation. The reduction in yield of grain caused by injury to the stalk is very important, and in New England during 1923 the loss from this source ranged from 8 to 30 per cent by weight in fields representing average infestation.

"Insecticide investigations have not yet developed any treatment that can be recommended. Winter mortality of the larvæ has averaged 8.5 per cent during the past four years. Activities of birds, especially woodpeckers, reduced the numbers of overwintering borers 72 per cent in certain localized areas. During 1923 there occurred a marked reduction of infestation in New England and in New York, while an appreciable increase occurred in Ohio and Michigan."

Parasite introductions: European corn borer (Pyrausta nubilalis Hubn.), D. W. JONES (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 117–120*).—The author reports that native parasitism is practically negligible except in the case of the sporadic egg parasite *Trichogramma minutum* Ril. Five species of European parasites of this pest have been introduced into this country, and another species which looks very promising will be liberated in 1924. Satisfactory recoveries are said to have been made of the species *Exeristes roborator* Fab.

Environmental studies on the European corn borer (Pyrausta nubilalis Hubn.), K. W. BABCOCK (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 120–125, fig. 1*).—This is a summary of investigations of the seasonal history of the European corn borer in various localities, consisting of (1) the possibility of two distinct species occupying areas of diverse seasonal history, (2) the possibility of a geographic race, and (3) the intimate study of the environment.

European corn borer investigations in Ohio, L. L. HUBER and C. R. NEISWANDER (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 125–128*).—This is a preliminary report of work done in 1923 by the Ohio Experiment Station. The life history of the borer as it occurs in northeastern Ohio, where it has one generation each year, is briefly summarized.

Measures recommended for the control of the European corn borer in the Province of Ontario, L. CAESAR (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 128–132*).—The author finds that there is only one brood of this pest each year in Ontario, that corn is practically the only host plant, and that most of the stalks, even of corn on the ear, are consumed by livestock.

Plowing as a factor in control of the European corn borer (Pyrausta nubilalis Hubn.) in Ontario, H. G. CRAWFORD (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 132–141*).—It is pointed out that clean plowing either in the fall or spring is the important control measure in the Canadian infestation in the disposal of that portion of the European corn borer population left in the field in the stubble and refuse after the removal of the crop.

The European corn borer, clean-up methods, T. H. PARKS (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 141–147*).—It is pointed out that the conditions under which corn is grown in northern Ohio make clean-up work for the European corn borer difficult to carry out.

Corn borer legislation in Canada, L. S. MCLAINE (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 147–149*).—A brief review of the subject.

Operation of Quarantine No. 43 on account of the European corn borer, L. H. Worthley (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 149–159*).—A brief discussion of the work.

Tentative plan for combating the oriental peach moth, T. J. Headlee (*New Jersey Stas. Circ. 167 (1924), pp. 4, figs. 5*).—This presents a schedule of treatments based upon life history studies conducted in Virginia (E. S. R., 46, p. 659) and New Jersey, and the knowledge that nicotin destroys the egg and newly hatched larva. It is pointed out that the plan is tentative, and merely offers a chance of escaping a large part of the injury that may occur to that portion of the peach crop which finishes with Elberta.

The control of the squash vine borer in Massachusetts, H. N. Worthley (*Massachusetts Sta. Bul. 218 (1923), pp. 69–80, pls. 2, figs. 2*).—This bulletin presents descriptions of the several stages of the squash borer, its life history and habits, nature of injury, natural enemies, and control measures. Experiments conducted at the station indicate that Blackleaf 40 at the rate of 1 part in 100 parts of water kills over 97 per cent of the eggs, and at the strength of 1 part in 250 parts of water kills over 90 per cent of the eggs.

"Spraying should be done four times at weekly intervals beginning the first week in July, using the stronger dosage with compressed air sprayers or similar machinery and the weaker dosage with barrel pumps or power sprayers. When thoroughly done spraying will largely eliminate borers from the fields. Complete extermination is then possible by cutting out the remaining borers during the middle of August. The treatment is estimated to cost between $25 and $30 per 1,000 plants. Thus intensive methods of culture and careful, economical spraying must be the rule where the treatment is to be found practicable on a commercial scale. However, estimates of various squash growers regarding the expected increase in yield from borer-free plants indicate an average net profit of over $200 per acre from the use of this treatment. For the home gardener, to whom cost of production is a small item, it offers a ready means of successfully fighting this most troublesome enemy of squashes."

The rôle of antibodies in the immunity of lepidopterous larvæ [trans. title], S. Métalnikov (*Ann. Inst. Pasteur, 37 (1923), No. 5, pp. 528–536*).—The studies here reported show that the caterpillar of the wax moth (*Galleria mellonella*), which possesses a remarkable resistance to massive infection and is very readily immunized, is nearly devoid of antibodies. The only antibodies discovered by the author in the blood of immunized caterpillars were found in a bacteriolysin that is active against the cholera vibrion and the dysentery bacilli. It is certain that these antibodies play an important part in the acquired immunity, since the vibrions are all very quickly destroyed without the presence of leucocytes. However, the production of bacteriolysins is very rare and occurs with only a few microorganisms. In the great majority of bacterial infections neither bacteriolysins nor other antibodies have been discovered.

Further observations on Tabanidae (horseflies) in Louisiana, T. H. Jones and W. G. Bradley (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 45–50*).—The authors report that an additional species has been taken as adult, and the larvae of nine species which had not been previously taken in this stage have been collected in the field.

The mercuric chlorid treatment for cabbage maggot control in its relation to the development of seed-bed diseases, H. Glasgow and W. O. Gloyer (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 95–101*).—The authors find that the application of mercuric chlorid solution, as used in the control of the cabbage maggot, holds in check Rhizoctonia and some of the other common diseases of cabbage seed beds, whereas use of the cheesecloth screen and applications of tobacco dust appear to favor the development of such diseases.

Some chemicals attractive to adults of the onion maggot (Hylemyia antiqua Meig.) and the seed corn maggot (H. cilicrura Rond.), A. Peterson (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 87–94*).—"The adults, males and females, of the onion maggot (*H. antiqua*) and the seed corn maggot (*H. cilicrura*) are attracted in large numbers to sweetened baits containing small amounts (1–2 drops to 5 cc.) of several alcohols, particularly allyl alcohol, isopropyl alcohol, ethyl alcohol, and butylic alcohol. Allyl alcohol and isopropyl alcohol were the most attractive. These alcohols mixed with honey and water as a medium were most attractive. Sweetened media, particularly molasses, honey, or brown sugar, containing yeasts (made with wet yeast, Fleischmann's Yeast, or dry yeast, Magic Yeast or Yeast Foam) also proved to be highly attractive to both species of flies.

"The baits containing alcohols lost their attractiveness as soon as the alcohol evaporated. This usually occurred 24 to 48 hours after they were placed in the field. Baits containing yeasts remained attractive 14 to 21 days or longer, provided they were not allowed to become dry.

"Sodium arsenite added to baits containing alcohols in amounts as large as 0.25 oz. to 1 qt. of bait did not bring about a perceptible change in the attractiveness of the bait, while this amount of sodium arsenite added to yeast baits apparently killed the yeast organism, for there was a marked diminution in the attractiveness of the bait, particularly with yeast baits made from dry yeast. In a number of experiments where sodium arsenite was used at the rate of 0.25 oz. to 5 qt. of the bait, especially where wet yeast was employed, the attractiveness of the bait was not materially reduced. Further experiments may show that very small amounts of sodium arsenite (sufficient to kill the flies) may be added to sweetened yeast baits without diminishing the attractiveness of the bait."

Spray to prevent the attack of Japanese beetle (*New Jersey Stas. Circ. 168 (1924), pp. 4, figs. 3*).—Directions are given for spraying early and late apples, late peaches, early peaches, cherries, and grapes to prevent injury from *Popillia japonica* Newm.

The Japanese beetle status in 1923, L. B. Smith (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 107–111*).—In this presentation of the subject the author states that during the season of 1923 the pest increased the area of its distribution from 770 square miles to approximately 2,500 square miles.

Combating the boll weevil (*Georgia Sta. Rpt. 1923, pp. 42, 43*).—A comparison was made during the year of three methods of boll weevil control. The late spring and dry summer seemed to favor the molasses mixture and calcium arsenate dust treatment when compared with the Florida method.

A preliminary report on the foreign parasites of Popillia japonica, C. P. Clausen and J. L. King (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 76–79*).—This is a general report on the progress of investigational work with parasites of the green Japanese beetle (*P. japonica*) in Japan and Chosen.

Recent European investigations of parasites of the gipsy moth, Porthetria dispar L., and the brown-tail moth, Euproctis chrysorrhoea L., S. S. Crossman and R. T. Webber (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 67–76*).—This is a discussion of recent investigations conducted by the authors in Europe.

Four-year experiments on the control of the red spider, S. W. Frost (*Jour. Econ. Ent., 17 (1924), No. 1, pp. 101–103*).—Notes are presented as to the status of the red spider (*Paratetranychus pilosus* C. & F.) in Pennsylvania. The author discusses two methods of control by the delayed dormant and summer applications. Miscible oils in the delayed dormant are said to kill a large percentage of the eggs, while lime sulphur has been found ineffective. Various types of sulphur spray during the summer have given satisfactory control, while dusts have given little or none.

FOODS—HUMAN NUTRITION.

Basal metabolism: Its determination and application, edited by F. B. SANBORN (*Boston: Sanborn Co., 1922, pp. 282, figs. 51*).—This is largely a compilation of material from various sources on methods and apparatus for determining basal metabolism and on the clinical application of such determinations. Several chapters consist of original papers by the editor and other investigators. Others are abstracts by the editor of material published elsewhere, and one chapter is devoted to brief summaries of recent papers not included in the rest of the text. Several useful tables and a list of selected references complete the volume.

Nutritional physiology, P. G. STILES (*Philadelphia and London: W. B. Saunders Co., 1922, 4. ed., pp. 300, pls. 4, figs. 19*).—A revision of the work previously noted (E. S. R., 40, p. 463).

The nutritive properties of wild rice (Zizania aquatica), C. KENNEDY (*Jour. Agr. Research [U. S.], 27 (1924), No. 4, pp. 219–224, figs. 2*).—A comparison is reported from the Minnesota Experiment Station of the nutritive value of wild rice and of ordinary rice, both polished and unpolished, as determined by chemical analyses and by feeding experiments conducted on rats. The minimum and maximum figures obtained in the proximate analysis of four samples of wild rice, two of which were obtained in the local markets and two direct from the Indians in the region of the Minnesota rice lakes, were, respectively, as follows: Moisture 7.74 and 8.93 per cent, protein 13.36 and 14.62, ether extract 0.455 and 0.893, fiber 1.29 and 1.94, starch 60.47 and 65.26, soluble carbohydrates as dextrose 2.33 and 3.69, and ash 1.09 and 1.38 per cent. A single analysis of cultivated unpolished rice and one of cultivated polished rice is reported with the following results: Moisture 12.22 and 12.30 per cent for unpolished and polished rice, respectively, protein 5.04 and 8, ether extract 2.01 and 0.30, fiber 1.08 and 0.20, starch 69.50 and 79, soluble carbohydrates as dextrose 0.85 per cent and not determined, and ash 1.01 and 0.40 per cent.

The distribution of inorganic constituents in wild rice, cultivated polished rice, and dry skim milk (for comparison) is given as follows: Calcium 0.018, 0.008, and 1.33 per cent, respectively; magnesium 0.080, 0.027, and 0.147; potassium 0.055, 0.069, and 1.27; sodium 0.064, 0.021, and 0.488; phosphorus 0.424, 0.102, and 0.979; and sulphur 0.252, 0.105, and 0.357 per cent. These figures show that both varieties of rice have very inadequate amounts of the essential ash constituents.

In the biological analysis of the wild rice it was first fed alone and then in combination with other substances, the growth curves obtained being compared with those reported by McCollum and Davis in a similar study of polished rice (E. S. R., 34, p. 367). The wild rice proved superior to polished rice, but was deficient in salts, vitamin A, and the quality of its protein. It apparently contained an adequate amount of vitamin B.

Contamination of milk, beverages, and other foods with zinc, J. W. SALE and C. H. BADGER (*Milk Dealer, 13 (1924), No. 7, pp. 90, 92; also in Indus. and Engin. Chem., 16 (1924), No. 2, p. 164*).—Attention is called to the danger involved in keeping semisolid or liquid food materials in galvanized iron containers. Determinations of zinc in tap, distilled, and carbonated water, milk, orangeade, and lemonade were made after the materials had been kept for 17 and 41 hours in ordinary galvanized iron pails. In nearly every case there was a progressive increase in the amount of dissolved zinc. Milk, which was estimated to contain about 5 mg. of zinc per kilogram before being placed in the container, contained 438 mg. per liter after 17 hours and 1,054 mg. per liter after 41 hours. Lemonade contained 1,411 mg. after 17 hours and 2,700 mg. per liter after 41 hours. Bottled root beer which had been reported to be unfit for human consumption was found to contain 229 mg. of zinc per liter.

Purified oysters, W. F. Wells (*Nation's Health, 5 (1923), No. 12, pp. 881–883, figs. 2*).—A brief review is given of the development of an artificial purification process for oysters grown under insanitary conditions. The object is to sterilize the outside of the oyster and to allow it, by natural processes, to free itself of such infected material as may be in its shell or body cavities. Chlorinated water is employed in the purification process by methods which are briefly described.

Eating for health in the Tropics of Central America, W. C. Rucker (*Nation's Health, 5 (1923), No. 12, pp. 861–863, 915, 916, 918, fig. 1*).—On the basis of experience, the author discusses tropical food problems with special reference to the American Tropics, and takes into account the food supply, the handling and preparation of food, and other such matters. There is a tendency, he states, "to overbalance the diet in the Tropics in the direction of the carbohydrates, and in some places the roughage element is too low. On the other hand in many localities there is too great a preponderance of meats. A balanced ration is just as necessary as in the Temperate Zone." There is no particular reason why one should not have just as good food in the Tropics as elsewhere, "provided the housewife will study the food problem carefully and use brains and energy in its solution. Intelligent marketing and selection of menus and cleanliness of servants, kitchen, and utensils are of basic importance. The big element of healthful eating in the Tropics though is the energetic application of brains and ceaseless vigilance."

A fresh air camp for undernourished children, D. D. Shira (*Nation's Health, 5 (1923), No. 11, pp. 771, 772, 836*).—In a paper presented at a health conference at Springfield, Ohio, in 1923, the author emphasizes especially the importance of teaching food values to all children whether they are undernourished or not as a way of striking at the root of physical unfitness.

Studies on the nature of Bacillus acidophilus therapy, N. Kopeloff and P. Beerman (*Arch. Int. Med., 33 (1924), No. 1, pp. 55–57*).—Further proof that the therapeutic action of *B. acidophilus* milk is essentially a bacteriological phenomenon (E. S. R., 49, p. 363) was obtained in the use of such milk centrifuged and run through a Mandler diatomaceous filter. This process alters the chemical constitution only a little, but removes the microorganism. When the milk thus treated was fed to constipated patients it was practically without effect, while regular *B. acidophilus* milk showed the usual favorable results.

Urinary excretion of organic acid and its variation with diet, L. McLaughlin and K. Blunt (*Jour. Biol. Chem., 58 (1923), No. 1, pp. 267–284, fig. 1*).—The daily urinary excretion of organic acid by eight normal women on their usual diets was determined by the Van Slyke-Palmer titration method with the particular object of comparing the excretion during the day while the subjects were engaged in their ordinary activities with the excretion during the night while the subjects rested, and also of comparing the excretion of organic acids on different diets. The day samples consisted of the urine passed between the time of rising and a definite time just before going to bed at night, and the night samples of any urine passed during the night and that on rising in the morning. For purposes of comparison, the values obtained were recalculated on the basis of a 24-hour period.

The average values obtained, from 6.8 to 10 cc. (uncorrected for organic bases) of N/10 acid per kilogram per day, are comparable with those for men reported by other investigators. The variation in excretion from day to day on a constant diet was considerable, showing that diet is not the only factor determining organic acid excretion. The excretion during the day was much higher than that of the night periods.

Determinations of hourly samples during fasting showed a variation of from 15 to 24 cc. of N/10 acid. A low protein, high calorie meal had little effect on the organic acid excretion, but diets high in fruit or in protein caused a marked increase in elimination. The excretion of uric acid was influenced by the same factors as those affecting the total organic acid excretion. Creatinin, creatin, uric acid, and amino acids constitute from one-third to one-half the quantity of organic acids and bases titrated in the Van Slyke-Palmer method.

Some observations on the creatinin excretion of women, L. McLaughlin and K. Blunt (*Jour. Biol. Chem., 58 (1923), No. 1, pp. 285–290*).—In connection with the above investigation, creatinin determinations by the Folin method were made on the urine of the eight subjects.

The minimum, maximum, and average values were 6.3, 9.6, and 7.5 mg. per kilogram of body weight. The range is practically the same as that reported by other investigators for men and women. The individual variations were in accord with the theory that the creatinin output varies with the mass of active protoplasmic tissue. The shorter women, with the heaviest fat deposits, had the lowest creatinin coefficients. One underweight subject had a high creatinin coefficient, 8.4, which is explained on the basis of absence of fat deposits with consequent higher percentage of active cells. This was confirmed by the analyses of the night urines of 10 young women who were 15 per cent or more underweight. In all cases the creatinin coefficient was higher than for normal women. Little difference was shown between the average day and night excretion of creatinin.

In a single series of experiments in which creatin was determined in hourly samples of urine during 3 days and in bihourly samples during 6 days, creatin was found in quantities varying from 4 to 24 mg. per hour.

Some experiments and remarks on the possible transformation of d-glucose in the intestine and on the nature of blood sugar, S. van Creveld (*Biochem. Jour., 17 (1923), No. 6, pp. 860–871*).—In this study of the nature of blood sugar, the first experiments conducted were a repetition of those of Hewitt and Pryde on the transformation of *d*-glucose in the intestines (E. S. R., 44, p. 259). In this work no evidence was obtained of mutarotation such as described by these authors.

To study the nature of glucose in the circulating blood, the aqueous humor of the eyes of normal rabbits was first used as representing an ultrafiltrate or "vivo-dialysate" of blood plasma and the decolorization of permanganate as a test for the existence of a reactive sugar. Directly after the eye puncture, the normal aqueous humor showed a rapid decolorization of permanganate which decreased decidedly in from 20 to 25 minutes. A possible mutarotation could not be determined with certainty with the technique used. A fairly good agreement was obtained between the reduction and the optical rotation of the humor. A similar study of diabetic aqueous humor obtained after subconjunctival adrenalin injection showed a more rapid decolorization of the permanganate solution than was the case with normal humor. No mutarotation was observed, and the optical value again corresponded closely to the reduction value. Similar tests with serum ultrafiltrate and with concentrated serum ultrafiltrate and concentrated aqueous humor gave no marked differences in reduction and optical values. No evidence of mutarotation was obtained during the increased removal of glucose from the perfusion liquid of the heart following insulin injection.

The effect of inadequate diet on the inorganic salt content of mother's milk, A. M. Courtney (*Amer. Jour. Diseases Children, 26 (1923), No. 6, pp. 534–541*).—This paper contains a review of the literature on the salt content of the milk of different species of animals as affected by the diet, followed by data on the distribution of the inorganic constituents in the milk of four women on deficient diets and the distribution of calcium and phosphorus in the blood of infants receiving the milk. For purposes of comparison data have been summarized from the literature on the variations in the salt content of normal human milk.

The diet of the first subject was low in total caloric value and contained too little fruit and vegetables. As compared with the normal average, the calcium and magnesium content of the milk was low, the potassium and phosphorus high, and the sodium and chlorin nearly normal. No values were outside the normal extremes. The blood calcium of the infant was 9.7 mg. per 100 cc. Blood phosphorus was not determined.

In the second case the diet was considered to be of too low caloric value, to contain too great a proportion of carbohydrate, and too little fat, and to be low in fat-soluble vitamin. Fruit and vegetables were lacking in the diet, and far too little milk was taken to provide the mineral requirement. The content of inorganic constituents in the milk varied from the average in the same direction as in the first case. The blood calcium was 5.2 mg. and the phosphorus 6.8 mg. per 100 cc.

The third subject was nursing twins four months of age. The chief defects in the diet were too low caloric value, too little fat, too much protein, practically no fruit and vegetables, and an entirely inadequate supply of milk. Values for the blood calcium of the two children were 9.2 and 9.7 mg. and of the phosphorus 2.6 and 4.6 mg. per 100 cc. The content of potassium and phosphorus in the milk was nearly normal, of sodium rather high, and of chlorin rather low. Both calcium and magnesium were below the lowest values reported for normal milk.

The chief defects of the diet of the fourth subject were too low caloric value, too much protein, too little carbohydrate, and entire lack of milk, butter, fruit, and all vegetables other than potato. The milk analysis showed very low calcium and phosphorus, low magnesium, normal potassium, and high sodium and chlorin content. The calcium content of the blood serum was 9.2 and of phosphorus 2.8 mg. per 100 cc.

All of the children, with the possible exception of the first, had well defined cases of rickets. It is concluded that the "continued use of a deficient diet by the nursing mother may have serious effects on the child, especially in the later stages of lactation when the mother's reserve has become depleted. Observations on the lower animals even suggest that, if the diet of the mother has been habitually below her own need in one or more constituents, her milk may be below standard even from the beginning of lactation."

Hydrogen ion concentration of gastric contents of infants, F. L. Abbott, Jr., J. A. Johnston, C. H. Haskins, and A. T. Shohl (*Amer. Jour. Diseases Children, 26 (1923), No. 5, pp. 475–485, figs. 2*).—Data are reported on the H-ion concentration of the gastric contents of infants as influenced by digestion time, previous type of feeding, age of the subject, and amount and concentration of the test meal. The determinations were made in all cases on the gastric contents obtained after a test meal of powdered milk and water, the standard meal consisting of 8 parts of milk to 100 parts of water. The pH values were determined by the colorimetric method of Shohl and King (E. S. R., 44, p. 505).

The normal range of H-ion concentration of the gastric contents from the milk test meal at the end of an hour was from pH 3.2 to pH 5, with 76 per cent of the readings between pH 3.9 and 4.6. The acidity was found to increase with time and age. The previous type of feeding had no effect. An increase in the concentration of the test meal to four times the original concentration decreased the H-ion concentration of the gastric contents. Doubling the amount of the test meal, while causing a stimulation of acid secretion, also caused a lessened acidity of the gastric contents.

The acidity of the gastric contents of infants, W. McK. Marriott and L. T. Davidson (*Amer. Jour. Diseases of Children, 26 (1923), No. 6, pp. 542–553, figs. 2*).—The theory upon which is based the use of lactic acid milk for infant feeding, as noted previously (E. S. R., 50, p. 856), is discussed, with data on the H-ion concentration of the gastric contents of normal infants and infants suffering from infections or nutritional disturbances when fed human milk, cow's milk, and lactic acid milk.

The acidity of the gastric contents of a group of normal breast-fed infants at the height of digestion averaged pH 3.75, while a similar group of undernourished hospital patients suffering from infections averaged pH 4.74. The pH values for normal and abnormal infants fed cow's milk were 5.1 and 5.35. Similar figures for lactic acid milk were 3.71 and 4.1, respectively.

The use of lactic acid instead of hydrochloric acid is preferred by the authors on account of the fact that lactic acid is completely oxidized in the body and does not throw the strain on the acid-base regulating mechanism that hydrochloric acid does.

Hydrochloric acid milk in infant feeding, H. K. Faber (*Amer. Jour. Diseases Children, 26 (1923), No. 5, pp. 401–410, figs. 2*).—The theoretical and practical advantages in the use of hydrochloric acid milk in infant feeding are discussed, with a detailed description of two case reports on its use. The theoretical discussion is based largely on the results reported in a previous paper (E. S. R., 50, p. 854). It is considered inadvisable to begin the use of acidified milk until after the first six weeks.

Vitamins A and B in fresh and canned pineapple, C. D. Miller (*Jour. Home Econ., 16 (1924), Nos. 1, pp. 18–26, figs. 6; 2, pp. 74–79, figs. 5*).—From the data presented in this study, the amount of fresh pineapple furnishing sufficient vitamin A for normal growth and well-being of young rats is fixed at slightly over 5 gm. daily. Canned pineapple was nearly as potent as fresh. As the sole source of vitamin B, 5 gm. of either fresh or canned pineapple promoted growth at slightly less than the normal rate and 10 gm. at normal rate. The data also give evidence of storage of vitmin A but not of vitamin B in the bodies of the experimental animals, and failure of reproduction in the experiments in which the value of pineapple as a source of vitamin A was studied.

The production of sterility with nutritional régimes adequate for growth and its cure with other foodstuffs, H. M. Evans and K. S. Bishop (*Jour. Metabolic Research, 3 (1923), No. 2, pp. 233–316, figs. 14*).—This is the complete report, with experimental data, of the investigation leading to the conclusion that there is a specific dietary factor, vitamin X, essential for reproduction (E. S. R., 50, p. 261).

Studies on the thermal death time of spores of Clostridium botulinum.—II, The differential staining of living and dead spores, G. S. Burke (*Jour. Infect. Diseases, 32 (1923), No. 6, pp. 433–438, fig. 1*).—In continuation of the investigation previously noted (E. S. R., 48 p. 164), it has been found that heat increases the permeability of the spores of *C. botulinum* to carbol fuchsin, and that the amount of heat necessary to bring about this change varies with the individual spores. A comparison of the increase in penetration of the stain with the loss of viability or death of the spores as determined culturally showed a striking parallelism. It is thought that the death of the spores (the thermal death time) precedes slightly complete dye penetration. These observations have been confirmed with other strains of *C. botulinum* and with spores of viable and heat-sterilized cultures of *Bacillus anthracis*, *B. subtilis*, *B. vulgatus*, and *B. cereus-fluorescens*. It is suggested that, while the method of determining the thermal death point of spores by the change in dye permeability can not replace the cultural method, much time and labor can be saved by using this method in preliminary tests and to serve as a control on cultural technique.

Studies on the thermal death time of spores of Clostridium botulinum.—III, Dormancy or slow germination of spores under optimum growth conditions, G. S. Burke (*Jour. Infect. Diseases, 33 (1923), No. 4, pp. 274–284*).—In continuation of the above investigation, evidence is presented that unheated spores of *C. botulinum* vary in the time required for germination under optimum growth conditions and that, while the majority germinate quickly, a few may lie dormant for a long time. In the experiments reported in the present investigation, 145 days was the maximum period of dormancy noted, but this is thought not to be the limit of such dormancy.

The spores which germinated after a long period of dormancy were found to behave in the same manner as those germinating more quickly. One of the chief factors causing dormancy is thought to be the relative permeability of the cell wall. Heat injury is considered to be only a secondary factor, if exerting any influence at all. It is concluded that fractional sterilization as generally practiced does not insure absolute sterilization of material containing spores of *C. botulinum*.

Germination of spores of Bacillus botulinus in collodion sacs in abdomen of guinea pigs and rabbits, G. E. Coleman (*Jour. Infect. Diseases, 33 (1923), No. 5, pp. 384–390*).—To determine whether heated spores of *B. botulinus* are capable of forming toxin in the body, capsules containing such spores were introduced into the abdomen of guinea pigs and rabbits and allowed to remain from 2 to 22 days, after which they were removed and the contents examined microscopically and culturally and tested for toxicity by injection into guinea pigs.

The results obtained confirm the conclusions of Coleman and Meyer (E. S. R., 49, p. 862) that spores are able to germinate and form toxin in the animal body. The toxin formed did not dialyze into the body fluids of the guinea pigs and rabbits. "As spoiled foods are sometimes veritable cultures of *B. botulinus* and may contain enormous numbers of the spores of this organism, it is of the utmost importance to know the possible effect of the ingestion of viable spores. Since they are able under unknown conditions to germinate in the animal body, the necessity for discarding spoiled foods is apparent, and no attempts to make them safe by heating should ever be attempted."

Toxin production and signs of spoilage in commercially canned vegetables and fruits inoculated with detoxified spores of Bacillus botulinus, P. Schoenholz, J. R. Esty, and K. F. Meyer (*Jour. Infect. Diseases, 33 (1923), No. 4, pp. 289–327*).—A detailed report is given of bacteriological and toxicological studies made on 346 cans of commercially packed food products artificially inoculated with washed and heated spores of *B. botulinus* and incubated at room temperature and at 35° C. for periods of from 10 days to 12 months.

As judged by the results obtained, the canned foods may be divided into three groups: "(1) Foods which exhibit marked physical and chemical changes and become regularly toxic, (2) very acid products, which rarely, if ever, show signs of botulinus spoilage, and (3) certain vegetables which spoil and become toxic irregularly. The products of the last group may be highly poisonous, but may present little or no visible signs of spoilage." In the first group are to be found corn, peas, sweet potatoes, salmon, and pumpkin. All of these materials underwent spoilage after relatively short incubation periods, and the decomposed products were very toxic. The second group contains very acid vegetables such as sauerkraut or tomatoes and all of the acid fruits. The only sign of spoilage consisted of slight bulging of the containers in some cases. In exceptional instances after prolonged incubation there was moderate toxic production.

The third group includes a variety of food products, some of which were spoiled and nontoxic, some spoiled and toxic, and some nonspoiled in appearance but toxic, the latter being the most frequent. The food materials in this group include asparagus, beets, unbroken olives, spinach, and evaporated or condensed milk. It is from this group that the greatest danger from botulism lies. In discussing this danger it is emphasized that the average consumers of home canned foods lack the necessary experience to make a competent examination of canned products.

"The prevention of human botulism will, therefore, remain a difficult problem until safe processing procedures are employed in the household for the preservation of certain vegetables. It is advisable to keep in mind that the judgment of such products is difficult, and their consumption may involve some risk. It must, therefore, be recommended that such food be recooked before serving it. In this connection attention is called to the fact that housewives frequently preserve fruits or vegetables which are not fresh. The spores of *B. botulinus*, if present, may rapidly increase in numbers whenever spoilage of the raw products occurs to any extent. The use of fresh and sound raw products, preferably obtained directly from the home garden and packed with the least delay, is one of the greatest means of protection against botulism. When once this prerequisite is appreciated by the home canner and processing procedures are employed which destroy the spores of this anaerobe in products with a pH above 4.5, the uncertainty and uneasiness which is felt by the consumer in judging or in deciding the ultimate disposal of an apparently sound or slightly spoiled can or jar of preserved food will be completely eliminated."

Two "food poisoning" outbreaks apparently due to bacilli of the paratyphoid enteritidis group, E. O. Jordan and J. C. Geiger (*Jour. Infect. Diseases, 32 (1923), No. 6, pp. 471–478*).—The features of special interest in the first outbreak of food poisoning reported in this paper, which occurred at Rockford College, Rockford, Ill., on April 8, 1922, are summarized as follows: "(1) The occurrence of three outbreaks, apparently due to a 'cream sauce,' in substantially the same group of persons; (2) the isolation of *Bacillus paratyphosus* A from the milk used in making the sauce and also from the stool of one of the persons affected; and (3) the apparent lack of an immunization process, as evidenced by the repeated attacks experienced by one and the same person."

The second outbreak, which occurred at Woodlawn High School, Birmingham, Ala., on September 27, 1922, was traced to the specific paratyphoid organism *B. paratyphosus* B found in meat used in sandwiches. The exact source of this contamination was not discovered.

ANIMAL PRODUCTION.

Nutritive value of wheat, J. L. St. John (*Washington Col. Sta. Bul. 180 (1923), pp. 17, 18*).—In continuing the studies of minerals in wheat rations (E.

S. R., 49, p. 265), varying amounts of potassium (0.03 to 4 per cent) have been included. The smaller amount seemed to furnish an approximate maintenance supply, while larger amounts caused loss in weight and prevented reproduction. Young from animals receiving a medium amount grew for a time, but later just maintained weight. The experiments have shown that potassium apparently will not replace sodium. Variations in the amount of chlorin in the ration may be large without affecting growth or reproduction. In a short study of the nutritive value of flour, deficiencies in calcium, chlorin, sodium, and vitamin A were noted.

Feeds and their use; inspection and analyses, J. D. Turner, H. D. Spears, and E. L. Jackson (*Kentucky Sta. Bul. 249* (*1923*), *pp. 89–327*).—The guaranties and actual analyses for protein, fat, and fiber of the samples of feeding stuffs officially analyzed in the State are tabulated. Other feeding information is also popularly discussed.

Commercial feeding stuffs, compiled and edited by N. E. Gordon and L. E. Bopst (*Md. Univ.* [*Quart.*] *No. 100* (*1923*), *p. 40, fig. 1*).—A report of the guaranties and analyses of the samples of feeding stuffs officially inspected in Maryland during the year ended May 1, 1923, is given, as well as other information on feeds of popular interest.

Commercial feeding stuffs, September 1, 1922, to August 31, 1923, B. Youngblood et al. (*Texas Sta. Bul. 314* (*1923*), *pp. 5–134*).—The guaranties and actual analyses are given of the samples of feeding stuffs officially analyzed during the year ended August 31, 1923, as well as other popular feeding information, as in previous reports (E. S. R., 48, p. 568).

The Feeding Stuffs Act, with amendments and regulations (*Ottawa; Canada Dept. Agr., Seed Branch, 1923, pp. 23*).—This contains the regulations governing the sale and manufacture of feeding stuffs in Canada and the accepted definitions of feeds.

The packing industry (*Chicago: Univ. Chicago Press, 1924, pp. XV+357, pls. 8, figs. 26*).—This book consists of a series of lectures delivered at the University of Chicago under the joint auspices of the School of Commerce and Administration and the Institute of American Meat Packers to furnish a comprehensive view of the packing industry. The subjects discussed are The Institute and Its Development Plan, by T. E. Wilson; Livestock: The Basic Raw Material of the Packing Industry, by H. C. Wallace; The Packing Industry: Its History and General Economics, by L. D. H. Weld; The Packing Plant and Its Equipment, by A. Cushman; Operations: Beef, Lamb, and By-Products, by V. H. Munnecke; Pork Operations, by O. G. Mayer; Financing the Packing Industry, by E. A. Cudahy, jr.; Science in the Packing Industry, by W. D. Richardson; and Distribution of Meat Products, by F. E. White.

Studies in animal nutrition.—IV, The nitrogen, ash, and phosphorus distribution in beef flesh as effected by age and condition, W. S. Ritchie, C. R. Moulton, P. F. Trowbridge, and L. D. Haight (*Missouri Sta. Research Bul. 59* (*1923*), *pp. 5–78*).—This is a continuation of the series of studies in animal nutrition previously noted from this station (E. S. R., 48, p. 474). The soluble solids, total nitrogen, albumin and globulin nitrogen, albuminose peptone nitrogen, amino acid and extractive nitrogen, soluble ash, and phosphorus content of the lean and fat composites and the rib, loin, and round lean and fat are given for the seven partially starved steers as previously noted by Moulton (E. S. R., 44, p. 570). Similar analyses are also given for the steers in the use of food experiments on which other data have been reported in earlier papers, as well as similar information from six other steers of varying ages and from three mature Jersey cows varying in age from 6 to 9 years.

In discussing the effect of age and condition on the nitrogen content, the authors concluded that the total nitrogen content of the lean flesh increases with age and is not materially affected by condition. In the lean flesh the soluble nitrogen and the heat coagulable nitrogen tend to become a larger part of the total nitrogen as age increases, but the amino acid and extractive nitrogen decrease. Similar results were noted with the dairy cows, indicating that conditions seem to have very little effect on the nitrogen content of the lean flesh. Slightly different results on the seven partially starved steers were noted in the earlier paper by Moulton.

The ash content of the fat of the ribs on a fat-free basis was higher than the ash of the rib lean, but the phosphorus content of the lean was higher. In the lean of the round, rib, and loin the total ash content did not seem to be influenced by age or plane of nutrition. The soluble ash of the fat animal, however, decreased with age, while in the thin animal the reverse was true. Soluble phosphorus and soluble organic phosphorus in the rib lean tend to increase as animals become thinner and to decrease with age, showing little change due to age in the fatty tissue. Partial starvation considerably reduced the total phosphorus, due largely to a reduction in the content of soluble organic phosphorus.

[Silage from corn stover and from normal corn for steers], G. A. Brown (*Michigan Sta. Rpt. 1922, p. 165*).—Another year's results of the trial previously noted (E. S. R., 48, p. 268) are given. The average daily gains of three lots of steers on rations of normal corn silage, stover silage, and stover silage with the corn removed when the stover was ensiled were 2.39, 1.72, and 2.03 lbs., respectively.

Steer feeding experiments [at the Scottsbluff, Nebr., Experiment Farm], J. A. Holden (*U. S. Dept. Agr., Dept. Circ. 289 (1924), pp. 35–37*).—More complete data are given on the experiments in which corn silage and beet tops were compared as supplements to a ration of alfalfa hay, dried beet pulp, and cottonseed cake and on the range pasture experiments, both of which were previously noted (E. S. R., 45, p. 574).

Beef cattle investigations [at the Washington Station], H. Hackedorn (*Washington Col. Sta. Bul. 180 (1923), pp. 11–13*).—The results of several experiments with beef cattle are reported.

Roughage rations for fattening 2-year-old steers.—In this experiment, conducted at the Irrigation Substation, 4 lots of 2-year-old steers averaging from 1,206 to 1,231 lbs. in weight were fed on the following comparative rations: Lot 1 alfalfa hay only, lot 2 1 part hay and 3 parts silage by weight, lot 3 same as lot 2 with the addition of 2 lbs. of cottonseed meal per head per day, and lot 4 the same as lot 2 with the addition of 12 lbs. of Eastern shelled corn per head daily. Lot 4 made the largest gains and was in the best condition, though the difference in selling price did not warrant the difference in cost of feeding.

Limited v. full grain rations in the fattening of yearling steers for the spring market.—Three lots of yearling steers averaging about 800 lbs. were fed on rations of 4, 8, and 12 lbs. of shelled corn in addition to alfalfa hay and corn silage in the proportion of 1:3 by weight. The average daily gains made by the respective lots were 2.28, 2.57, and 2.22 lbs.

A study of the value of corn silage in rations of calves fattened for baby beef.—To estimate the value of corn silage for baby beef production at the Irrigation Substation 1 lot of 40 calves averaging 469 lbs. was fed 7.2 lbs. and corn silage in the proportion of 1:3 by weight. The average daily gains of 2.08 lbs. in a 63-day feeding period. Another lot of 43 similar calves fed

6.8 lbs. of shelled corn, 4.4 lbs. of hay, and 14.5 lbs., of corn silage made average daily gains of 2.11 lbs. The silage feeding was calculated to be slightly less expensive.

Herd management.—An average of 681 lbs. of alfalfa and 3,768 lbs. of sunflower silage have been required to winter a 1,300-lb. beef cow over a 3-year period. One acre of alfalfa will yield 1⅓ tons of hay in addition to supplying 85 pasture days for a cow.

[Feeding experiments at the Worland, Wyo., State Industrial Institute] (*Wyoming Sta. Rpt. 1923, pp. 67, 68*).—The conclusions derived from these cooperative experiments indicate that "wet beet pulp with alfalfa made the most rapid gains at the least cost when the steers were fed. Molasses and alfalfa made the smallest gains and least profit. Corn and alfalfa made next to the lowest profit. Corn silage and alfalfa was next to the highest . . . . Milk was produced about 4 cts. per hundredweight cheaper on a ration of wet pulp and alfalfa than upon a ration of corn silage and alfalfa."

Wintering calves (*Wyoming Sta. Rpt. 1923, p. 53*).—The combined results of two years' experiments in comparing rations for wintering calves (E. S. R., 49, p. 466) showed that native hay may be used for roughing calves through the winter without loss of weight when fed at the rate of 10 lbs. per day. Sixteen lbs. of alfalfa hay were required per day by the calves when they received free access to the feed, but they also made slightly better growth. Sunflower silage had to be discontinued in the second year's experiments because of the poor results obtained with it.

Sheep investigations [at the Washington Station], H. Hackedorn (*Washington Col. Sta. Bul. 180 (1923), pp. 14, 15*).—The lamb feeding trials previously noted (E. S. R., 48, p. 269) from the Irrigation Substation were largely repeated, and 14 lots of 50-lb. lambs were again fed for 60 days. Corn silage was fed to 7 of the lots in which different amounts of grain were compared, and 3 lots received varying amounts of beet molasses. The third cutting of alfalfa hay proved to be of almost equal feeding value with the first and second cuttings, whereas the sweet clover was inferoir to alfalfa.

The finish of the lambs receiving the smaller amounts of grain was markedly better, but the spread in finish was not as great as in the previous year. The lot receiving a full feed of corn silage made the most rapid gains. Varying amounts of beet molasses seemed to have little effect on the finish, though the gains seemed best when a medium amount was fed.

Cost of feeding Leicester sheep one year, J. A. Ste. Marie (*Canada Expt. Farms, Ste. Anne de la Pocatière (Que. Sta. Rpt. Supt. 1922, p. 9*).—Thirty-five Leicester ewes, 15 ewe lambs, and 3 rams were found to consume the following amounts of feed in one year at the estimated prices given: 14,100 lbs. of hay at $12 per ton, 7,308 lbs. of oats at $40 per ton, 7,700 lbs. of bran at $24 per ton, 3,140 lbs. of roots at $4 per ton, and pasture calculated at 40 cts. per head.

The wool yearbook, 1924 (*Manchester, Eng.: Marsden & Co., Ltd., 1924, 16. ed., pp. LXXXIII-XCII+571, figs. 305*).—This book gives data on the world's trade in wool and other information of primary interest to the manufacturer of textiles.

Lamb feeding experiments [at the Scottsbluff, Nebr., Experiment Farm], J. A. Holden (*U. S. Dept. Agr., Dept. Circ. 289 (1924), pp. 31–33, figs. 2*).—This is a more detailed report of the lamb feeding experiments carried on during the winter of 1920–21 (E. S. R., 47, p. 775).

Lamb breeding for the meat trade.—White faced breeds and crosses, J. G. Cook (*New Zeal. Jour. Agr., 27 (1923), No. 5, pp. 294–297*).—A discussion is given of the desirability for the meat trade of lambs resulting from crosses of Merino ewes with other breeds. Lincoln and English and Border Leicester rams are especially recommended for this purpose.

Protein supplements for growing pigs, C. C. Palmer (*Delaware Sta. Bul. 135 (1924), pp. 12, 13*).—In this experiment 4 lots of 4 pigs each were selected for a test of protein supplements consisting of 10 lbs. of tankage in lot 1, 26 lbs. of soy beans in lot 2, 12 lbs. of fish meal in lot 3, and 15 lbs. of peanut meal in lot 4 to a grain ration of 90 lbs. of hominy and 40 lbs. of flour middlings. The following table summarizes the results:

Comparison of protein supplements for growing pigs.

Lot.	Average initial weight.	Average daily gain.	Feed consumed per 100 lbs. gain.			Calculated feed cost per 100 lbs. gain.
			Hominy.	Middlings.	Protein supplement.	
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	
1	26.25	0.824	247.01	109.81	27.51	$6.56
2	25.50	.493	245.71	109.20	71.00	7.81
3	26.25	.850	207.25	92.02	27.68	5.53
4	26.25	.689	269.29	119.68	44.89	7.01

Soft pork investigations (*Georgia Sta. Rpt. 1923, pp. 50, 51*).—Additional work on this project (E. S. R., 49, p. 573) "showed that 100-lb. pigs, softened on peanuts during a period of 60 days, are made firmer by subsequent feeding of hardening feed. However, no practical method of producing strictly hard carcasses from such hogs seemed possible."

The value of buttermilk and lactic acid in pig feeding, J. B. Lindsey and C. L. Beals (*Massachusetts Sta. Bul. 217 (1923), pp. 61–67*).—The results of experiments are reported in which semisolid and dried buttermilk and lactic acid were fed to pigs.

In the first experiment, lasting 126 days, 5 lots of 2 30- to 50-lb. pigs each were selected and fed as follows: Nine oz. of a grain mixture of ground oats, flour middlings, and corn meal 1:2:2 were mixed with a quart of warm water and fed to all lots in amounts sufficient to satisfy their appetite. In lot 2 this grain mixture was modified by the addition of 10 per cent of tankage until the pigs reached 100 lbs. in weight, after which only 5 per cent of tankage was included. In addition to the grain mixture, lots 3 and 4 received 4 and 8 qt., respectively, of diluted semisolid buttermilk per day and lot 6 received 24 oz. of dried buttermilk stirred in 8 qt. of water. A suitable mineral mixture was supplied to all pigs. The lots receiving the buttermilk products made the best gains, but the costs of feed were too great for practical use. The daily gains per pig were in lot 1 0.95 and 0.96 lb., lot 2 1.1 and 0.87, lot 3 1.07 and 0.92, lot 4 1.22 and 1.09, and lot 6 1.27 and 1.43 lbs. The calculated costs per 100 lbs. of gain were $7.22 in the lot receiving grain only, $8.55 when tankage was fed, $14.47 when the smaller amount of semisolid buttermilk was fed, $18.91 in the other semisolid buttermilk lot, and $13.16 in the lot receiving dried buttermilk.

To study the value of lactic acid in the rations of pigs, 2 lots of 2 30-lb. pigs each were selected and fed 9 oz. of a grain mixture consisting of corn meal, wheat middlings, ground oats, and tankage 28:28:28:16 per quart of water during a 116-day trial. In addition skim milk was supplied to lot 1 in amounts up to 12 qt. per day, which was reduced to 8 qt. when the pigs reached 100 lbs. In lot 2 the water mixed with the grain contained 0.7 per cent lactic acid. The daily gains made were 1.12 and 1.28 lbs. by the pigs in lot 1 and 0.81 and 0.78 lb. in lot 2.

In a second experiment with lactic acid, 3 lots of 2 20- to 30-lb. pigs received for 70 days a ration of 8 oz. of a grain mixture of corn meal, wheat middlings, ground oats, and tankage 3:3:3:1 per quart of water. The water used for lots 2 and 3 contained 0.4 and 0.8 per cent lactic acid, respectively. The daily gains made by the pigs in the respective lots were 0.54 and 0.54, 0.59, and 0.51, and 0.50 and 0.60 lb. No advantage from lactic acid feeding was noticed in either of the experiments, though it is stated that lactic acid may have a therapeutic action in animals subject to digestive disturbances.

[Comparison of grains for swine], G. A. Brown (*Michigan Sta. Rpt. 1922, pp. 165–167*).—The results of five feeding trials with seven lots of 59- to 146-lb. pigs are summarized in the following table:

Grain feeding tests with swine.

Lot.	Number of pigs fed.	Average daily gain.	Feed consumed per 100 lbs. gain.				
			Shelled corn.	Ground barley.	Ground rye.	Middlings.	Tankage.
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	30	1.39	239	53.5	139		30.5
2	30	1.15			414		42.0
3	30	1.30		444.0			28.0
4	30	1.47	395				40.0
5	32	1.21		257.0	178		32.0
6	32	1.17		269.0		157.7	26.6
7	32	1.12			195	226.0	25.0

The returns for the grains fed are also tabulated on the basis of returns for hogs at the rate of $6 to $10 per 100 lbs.

Corn for hogging-off, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 88, 89*).—Seventeen pigs averaging about 130 lbs. in weight made average daily gains of 1.26 lbs. during 24 days in September on 1.28 acres of Pearl flint corn, with the additional feed of 870 lbs. of skim milk. There was produced 401.56 lbs. of pork per acre and it was estimated that the corn yielded 2,372 lbs. per acre.

[Home-grown feeds for fattening swine], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 82–85, figs. 2*).—In comparing home-grown feeds for fattening, 5 lots of 7 pigs each were selected and fed the following grain mixtures in self-feeders for 70 days: Lot 1 corn and oats 1:1, lot 2 barley, oats, and tankage 4.5:4.5:1, lot 3 corn and oats 1:1 and skim milk, and lots 4 and 5 corn, oats, and tankage 4.5:4.5:1. Lots 1, 2, and 5 were fed on pasture and lots 3 and 4 in dry lot. The results of the experiment are summarized in the following table:

Comparison of home-grown feeds for swine.

Lot.	Average initial weight.	Average daily gain.	Feed consumed per 100 lbs. gain.			Feed cost per 100 lbs. gain.
			Grain.	Tankage.	Skim milk.	
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	
1	57.5	1.22	430.46			$4.18
2	61.3	1.15	367.24	41.83		4.34
3	59.3	1.08	470.57		431.39	5.42
4	60.4	.80	559.41	60.97		6.99
5	66.3	1.33	393.92	44.19		4.96

Swine feeding experiments [at the Morris Substation], P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1922, pp. 53–55*).—Five lots of 5 Duroc-Jersey pigs were selected for a 93-day comparison of different rations, some of which were continuations of the trials previously noted (E. S. R., 48, p. 372). Lots 1 and 2 received corn and corn and tankage, respectively, self-fed as supplements to alfalfa pasture, whereas lots 3, 4, and 5 received corn, corn and tankage, and barley and tankage, respectively, as supplements to rape pasture. The results of the experiment are summarized in the following table:

Summary of tests of various rations for swine.

Lot	Average per pig.		Feed consumed per 100 lbs. gain.			Tankage in ration	Cost of feed per 100 lbs. gain.[1]	Profit per 100 lbs. pork.[2]
	Initial weight.	Daily gain.	Corn.	Barley.	Tankage.			
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Per ct.*		
1	46.30	0.98	347				$2.60	$6.40
2	45.50	1.24	316		38	10.80	3.51	5.50
3	45.30	.92	374				3.80	6.20
4	45.10	1.42	312		25	7.40	3.26	5.70
5	45.30	1.43		400	25	6.09	4.28	4.72

[1] Tankage $70 per ton, corn 42 cts. per bushel, and barley 40 cts. per bushel.

[2] Pork $9 per 100 lbs.

Alfalfa pasture for hogs [at the Scottsbluff, Nebr., Experiment Farm], J. A. Holden (*U. S. Dept. Agr., Dept. Circ. 289* (*1924*), *pp. 29, 30*).—In continuing the trials in pasturing 0.25-acre plats of alfalfa with hogs (E. S. R., 45, p. 575) in 1921, 16 fall farrowed shotes gained a total of 1,000 lbs, during the spring period, and 32 spring farrowed pigs gained 1,476 lbs. during the summer period. A 2 per cent ration of corn was fed in addition to the pasture, an average for both periods of 2.75 lbs. being consumed per pound of gain.

Systems of fattening pigs on forage, H. Hackedorn (*Washington Col. Sta. Bul. 180* (*1923*), *pp. 15, 16*).—In continuing this study (E. S. R., 47, p. 575), two lots of 12 50-lb. pigs each were given access to a 2-acre plat of alfalfa. Each lot received a grain ration of rolled barley, millrun, and tankage, the one lot being full fed (4.8 lbs, per head) and the other lot receiving only one-half as much. At the end of 45 days the former lot averaged 98 lbs. and the latter only 84 lbs. During a succeeding 37-day feeding period on 2-acre plats of field peas, the thinner pigs gained an average of 1.06 lbs. per day as compared with 0.98 lb. by the other lot. Market condition was reached by both at about the same time, thus a saving of grain was made by the lot receiving restricted rations.

Cost of feeding 12 sows one year, J. A. Ste. Marie (*Canada Expt. Farms, Ste. Anne de la Pocatière* (*Que.*) *Sta. Rpt. Supt. 1922, p. 9*).—The following amounts of feed were required at costs given to carry 12 Yorkshire sows kept outside in small hog cabins during one year: 10,110 lbs. of bran at $24 per ton, 6,692 lbs. of shorts at $25 per ton, 2,505 lbs. of screenings at $20 per ton, 5,675 lbs. of clover hay at $12 per ton, and 7,210 lbs, of green feed and roots at $5 per ton. An average of 7 pigs were weaned per sow.

Handbook on the bacon hog and hog grading, A. A. MacMillan (*Canada Dept. Agr. Pamphlet 40, n. ser.* (*1923*), *pp. 24, figs. 17*).—This is a popular discussion of the breeds of bacon hogs and the purposes and method of grading hogs.

Productive horse husbandry, C. W. Gay (*Philadelphia and London: J. B. Lippincott Co., 1924, 3. ed., rev., pp. XVI+335, pl. 1, figs. 174*).—This is another edition of the book previously noted (E. S. R., 31, p. 269), with some changes in the chapter on The Motor as a Factor, including comparative costs of horse and motor transportation.

Breeds of horses, P. Diffloth (*Races Chevalines. Paris: Libr. J.-B. Baillière & Son, 1923, 5. ed., rev., pp. 512, figs. 133*).—Brief descriptions are given of the different breeds of horses, classified according to the country in which they originated.

[Feed cost of raising colts and producing horse labor], J. A. Ste. Marie (*Canada Expt. Farms, Ste. Anne de la Pocatière (Que.) Sta. Rpt. Supt. 1922, pp. 6, 7*).—In raising four colts from birth to 2 years of age, from 1,220 to 1,605 lbs. of hay, 886 to 1,206 lbs. of oats, and 204 to 293 lbs. of bran were required from birth to 1 year of age by each of the colts. From 1 year to 2 years of age they required from 2,846 to 2,983 lbs. of hay, 2,237 to 2,579 lbs. of oats, 995 to 1,027 lbs. of bran, and four months of pasture.

Work horses producing an average of 2,034 hours of work per year consumed an average of 5,636 lbs. of hay, 4,378 lbs. of oats, and 793 lbs. of bran. No account was taken of the feeds received by the colts through suckling their dams nor of the fact that three of the mares on which the cost of labor was calculated raised foals.

Poultry problems, L. E. Card (*Springfield: Ill. Farmers' Inst., 1924, pp. 19, figs. 12*).—A discussion of important poultry problems is given in a popular manner.

The poultry keeper's textbook, E. T. Brown (*London and Melbourne: Ward, Lock & Co., Ltd., 1924, pp. 320, pls. 67*).—This is a practical manual of poultry production, dealing with the principles of breeding, care, management, feeding, and diseases of poultry, with discussions of methods of marketing eggs and poultry and other information of practical value.

White v. yellow maize as poultry food, T. D. Hall (*Natl. Poultry Jour., 4 (1923), No. 182, pp. 404, 405, fig. 1*).—The results of two experiments, carried on at the Potchefstroom School of Agriculture, South Africa, in comparing the growth of chicks on rations containing white and yellow corn, are reported. The first experiment was more or less unsatisfactory as wattle twigs were available as a source of vitamin A, and some alfalfa was also fed by mistake. The second experiment, in which the kind of corn fed was reversed after six weeks' feeding to the two lots, indicated that white corn, when supplemented only by skim milk, mineral salts, oyster shells, and grit, was deficient in some substance which is present in yellow corn. By feeding alfalfa with the white corn the chicks were able to grow as rapidly and stay in as good condition as with the yellow corn.

Calcium metabolism in the laying hen, G. D. Buckner, J. H. Martin, and A. M. Peter (*Kentucky Sta. Bul. 250 (1923), pp. 331–367*).—This is a more complete report of the experiments previously noted in two papers (E. S. R., 47, p. 576). All data are tabulated in detail.

A description of a four-legged chick, M. D. Sumulong (*Philippine Agr., 12 (1923), No. 7, pp. 303–306, pls. 2*).—The anatomy of a chick is described in which the posterior part of the alimentary tract (beyond the ceca), the pelvic girdle, and the legs were double.

The importance and value of poultry feathers (*Jour. Min. Agr. [Gt. Brit.], 30 (1924), No. 11, pp. 1036–1039*).—A brief account is given of the method of marketing and grading poultry feathers, prices to be expected, and the imports into the United Kingdom by countries during 1913, 1920, and 1922.

The guinea fowl, A. S. WEIANT (*U. S. Dept. Agr., Farmers' Bul. 1391 (1924), pp. II+13, figs. 6*).—This revision of Farmers' Bulletin 858 (E. S. R., 38, p. 174) has been prepared by A. R. Lee.

Homing pigeons; their care and training, A. R. LEE (*U. S. Dept. Agr., Farmers' Bul. 1373 (1923), pp. II+16, figs. 9*).—The methods of care, management, feeding, breeding, and training of homing pigeons are discussed.

The national standard squab book, E. C. RICE (*Cambridge, Mass.: Murray Ptg. Co., 1924, pp. 416, figs. 196*).—A popular manual on squab production.

Angora rabbit wool production: A profitable spare-time occupation, W. WATMOUGH (*Jour. Min. Agr. [Gt. Brit.], 30 (1924), No. 11, pp. 1051–1053, pl. 1*).—A brief discussion is given of the wool production of Angora rabbits, its value, and uses.

DAIRY FARMING—DAIRYING.

Dairy research and education, R. A. PEARSON (*[Berkeley: Univ. Calif. Col. Agr., 1923], pp. 23*).—In this address, delivered at the dedication of the dairy industry building at the University of California in October, 1922, the history and development of dairying is briefly reviewed, with special reference to the part played by dairy research and education.

Better feeding for Indiana dairy cows, L. H. FAIRCHILD and J. W. WILBUR (*Indiana Sta. Bul. 277 (1924), pp. 16, figs. 5*).—To study the effect of proper feed and care on milk production, five grade mature cows having low records were selected from the cow-testing associations of the State and fed at the station for one year. All of the cows consumed more feed at the station, but they also produced more milk, and the calculated profits per cow averaged 74 per cent greater. The improvements in feeding consisted mainly in supplying more and better roughage (especially silage and legumes) and by supplying protein supplements to the grain ration.

[Comparative rations for milk production], J. A. HOLDEN (*U. S. Dept. Agr., Dept. Circ. 289 (1924), pp. 34, 35*).—Two short experiments were carried on at the Scottsbluff, Nebr., Experiment Farm in 1921. In the first test corn silage and beet tops were alternated every two weeks in the rations of 5 cows during an eight weeks' period. The average milk produced on the different rations was the same. A warning is given against allowing cows too much beet tops, however, as not sufficient of other feeds will be eaten.

In another comparative trial, 7 cows were alternated between sweet clover and grass pasture in biweekly periods during the summer (132 days). The total average milk production on both pastures was the same.

[Experiments in dairy bacteriology at the Michigan Station], G. L. A. RUEHLE (*Michigan Sta. Rpt. 1922, pp. 178–181, 182, 183*).—The following studies dealing with the isolation of abnormal bacteria from dairy products are briefly noted:

Examination of a brand of filled evaporated milk for the cause of a bitter flavor (pp. 178, 179).—Four types of spore-forming rods isolated from a can of filled evaporated milk in which bitter flavors had been produced were found to produce bitter flavors in 27 days when inoculated into other samples of like milk. Three rods and three cocci isolated from another sample were found to produce a like condition after 17 days.

Examinations of "Ever Fresh" milk (pp. 179–181).—A sample of this commercial product was examined and found to be very low in bacterial content, though not sterile. A number of spore-forming rods found to be anaerobic were isolated from a sample which curdled after three months' storage at room temperature. The milk was successfully kept for three months on ice, however. Further examination of the milk indicated that it had been homogenized, and a custard-like taste indicated repeated pasteurization. A slightly astringent, though not unpleasant, flavor of overheated milk was also noted.

Examination of two samples of cream for undescribable flavors (pp. 182, 183).—A putrid flavor in one sample of cream was found to be due to a spore-forming rod. A sickish flavor in another sample was due to a very short oval rod producing "a small, round, white, elevated, glistening, surface colony and a small, round, gray, dull, subsurface colony."

Examination of pink buttermilk (p. 183).—An investigation of the cause of a pink color in buttermilk, a yeast and *Bacterium lactis acidi* were cultured from it, but these organisms would not produce the color in other milk. Rod-shaped bacteria were also present in the milk but were not cultivated.

Off-flavor in a sample of milk (p. 183).—A very short rod isolated from a sample of milk having a disagreeable sickish flavor and odor was found to produce a similar flavor and odor when inoculated into sterile milk.

Yeasty cream in a creamery (p. 183).—The presence of yeast cells in cream from a single producer not properly cleaning his utensils were found to be the cause of a yeasty flavor and a foamy condition in the cream at this creamery.

Studies of the streptococci.—IX, Streptococci of souring milk with special reference to Streptococcus lactis, S. H. Ayers, W. T. Johnson, jr., and C. S. Mudge (*Jour. Infect. Diseases, 34 (1924), No. 1, pp. 29–48, fig. 1*).—This is a detailed report of the investigation previously noted from an abstract (E. S. R., 50, p. 279). The ordinary cultural characteristics of *S. kefir* are like *S. bovis*, but distinguishable from the latter by the production of CO_2 from dextrose. *S. lactis* is characterized by a rapid production of acid in milk. Two varieties have been observed, one of which (A) produces CO_2 and NH_3 from peptone, while the second (B) does not. Commercial starters have been found to contain either or both varieties. Variations in the ability of different strains of each variety to ferment sugars have also been observed.

Studies of the streptococci.—X, Relation of Streptococcus fecalis to S. lactis, S. H. Ayers and W. T. Johnson, jr. (*Jour. Infect. Diseases, 34 (1924), No. 1, pp. 49–53*).—The cultural characteristics of the predominating species of streptococci recovered from 33 cultures of the feces of five humans, termed *S. fecalis*, have been found to agree closely with those of *S. lactis* except that the latter are more vigorous.

Methylene blue project (*New Hampshire Sta. Bul. 212 (1924), pp. 34, 36*).—The methylene blue test has been found by J. M. Fuller and H. F. DePew to be a satisfactory index of the keeping quality of milk. The relation between the reduction time and the bacterial count has been expressed as follows: Less than 3 hours 500,000 or more bacteria per cubic centimeter, 4 to 7 hours 150,000 per cubic centimeter, and more than 8 hours less than 25,000 bacteria per cubic centimeter. No definite relationship was observed between the bacterial count and the acidity of the milk.

The production of clean milk, A. T. R. Mattick (*London: The Dairyman, Ltd., 1923, pp. 53, figs. 22*).—The general principles to be observed in the production of clean milk are discussed.

A study of the milk supply of Lansing and East Lansing, L. H. Cooledge, E. J. Friar, and W. S. Robbins (*Michigan Sta. Rpt. 1922, pp. 187–191*).—The results of a study of scoring the sanitary conditions of the milk plants supplying milk to East Lansing and Lansing, Mich., are reported, and the quality of the milk delivered by individual dairies to some of the plants noted as determined by the pH score (E. S. R., 47, p. 281). Certain conclusions derived from this study are also given.

A study of the milk supply of Ypsilanti, Mich., L. H. COOLEDGE, E. J. FRIAR, and C. B. PILLSBURY (*Michigan Sta. Rpt. 1922, pp. 191–195*).—A study of the milk supply of Ypsilanti, Mich., is described, which was carried on similarly to the ones in Lansing and East Lansing, with like results.

The sale and advertising of dairy products, N. C. TOMPKINS (*Milwaukee, Wis.: Olsen Pub. Co., 1924, pp. 127, figs. 29*).—Methods of advertising and selling ice cream, market milk, butter, and cheese are especially discussed, as well as the methods of selling and advertising to be employed by the dairy farmer.

The Dairy Industry Act, 1914, as amended in 1923 (*Ottawa: Canada Dept. Agr., Dairy and Cold Storage Branch, 1923, pp. 18, fig. 1*).—This is the Canadian Dairy Industry Act of 1914 as amended in 1923 to prevent the sale or manufacture of butter substitutes.

Annual reports of the Dairymen's Association of the Province of Ontario, 1921 and 1922 (*Dairymen's Assocs. Ontario Ann. Rpts. 1921–1922, pp. 72*).—Reports are given of the three annual meetings of the two dairymen's associations of eastern and western Ontario, held in January, 1921, 1922, and 1923.

Caring for cream on the farm, I. MCKELLIP (*Ohio Agr. Col. Ext. Bul., 19 (1923–24), No. 1, pp. 12, figs. 4*).—The important factors to be considered in the production of clean milk and for the proper cooling and keeping of cream on the farm are discussed.

The relation of the Streptococcus lactis content of curdling milk to the rapidity of the ripening of cheese [trans. title], E. HAGLUND, C. BARTHEL, and E. SANDBERG (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 250 (1923), pp. 19*).—Experiments in which cultures of *S. lactis* having varied ability for splitting casein have been added to the milk are reported. The differences in these cultures did not seem to affect the rapidity of the ripening of the cheese made from such milk, but, basing the degree of ripening of cheese on the amount of soluble nitrogen formed, it was found "that the rapidity of the ripening of hard cheeses is directly dependent on the number of lactic acid bacteria in the cheese milk at the moment of adding rennet. This fact supports the theory that the lactic acid streptococci exercise a direct as well as an indirect influence upon the ripening process." The work is summarized in English.

How to produce ice cream with a low bacterial content, A. C. FAY and N. E. OLSON (*Kansas Sta. Circ. 103 (1924), pp. [41]*).—The operations are discussed for the production of ice cream with a low bacterial count, which may be accomplished largely through the use of clean utensils, pasteurization, and raw materials of good quality.

A simplified method of standardizing the ice cream mix, N. E. OLSON (*Kansas Sta. Circ. 104 (1924), pp. 12*).—Essentially noted (E. S. R., 48, p. 176).

VETERINARY MEDICINE.

Outlines of medical zoology, with special reference to laboratory and field diagnosis, R. W. HEGNER, W. W. CORT, and F. M. ROOT (*New York: Macmillan Co., 1923, pp. XV+175, pls. 2, figs. 163*).—A general literature list of 41 titles is presented (pp. XIII–XV). Part 1 of the work, by Hegner (pp. 3–55), deals with protozoa parasitic in man; part 2, by Cort (pp. 59–98), with worms parasitic in man; and part 3, by Root (pp. 101–165), with arthropods of medical importance.

Proceedings of the Wisconsin Veterinary Medical Association, 1922 (*Wis. Vet. Med. Assoc. Proc., 7 (1922), pp. 106, figs. 9*).—Papers presented at the annual meeting held at Madison, Wis., in January, 1922, include the following: Mastitis in Cows, by W. F. Nolechek (pp. 34–37); Control of Roup and Chicken

Pox, by B. A. Beach (pp. 37–42); Health in Relation to Feeding of Livestock, by J. M. Fargo (pp. 43–52); Types of Farm Poultry, by J. G. Halpin (pp. 52–57); Swine Diseases as We Find Them in the Field, by W. H. Dreher (pp. 58–65); The Value of Bacterins in the Treatment of Swine Diseases, by W. L. Richards (pp. 65–67); Suggestions for the Care of Swine Before and After Vaccination, by R. S. Heer (pp. 67–71); When and How to Vaccinate Hogs, by J. R. Fesler (pp. 71–73); The Practicing Veterinarian and the Accredited Herd Work, by J. G. Townsend (pp. 74–77); What We Know About Abortion, by F. B. Hadley (pp. 83–90); and Foreign Poisoning, by R. Graham (pp. 90–98).

[Animal disease investigations at the Michigan Station], H. J. Stafseth (*Michigan Sta. Rpt. 1922, pp. 196–198*).—Vaccine for chicken pox prepared according to the method of Beach (E. S. R., 47, p. 685) was tested on a flock, one-half of over 4,000 chickens being vaccinated, but failed to show any curative value. Medicinal agents such as trypan blue, powdered alum, potassium permanganate, argyrol, iodin and glycerin equal parts, and aborno were tested in the laboratory and on several large farms without showing curative or preventive qualities. In agglutination tests for bacillary white diarrhea, 273 of 2,779 fowls tested gave positive reactions. The results of autopsies made upon 146 fowls are reported in tabular form.

A fatal disease of colts, which occurred in March, 1922, among sucking colts at the college farm and is described as an acute interstitial nephritis, is briefly reported upon. Investigations of an acute septicemia of foxes resulted in the isolation of a small micrococcus which proved fatal for guinea pigs.

[Report of the Washington Station] division of veterinary science, J. W. Kalkus (*Washington Col. Sta. Bul. 180 (1923), pp. 56–58*).—In continuation of investigations of the orchard horse disease (E. S. R., 49, p. 278), it was found that lead arsenate spray is, probably, primarily responsible, but that it does not produce this condition as a poison to the animal's body. Investigations of a disease affecting ewes in advanced pregnancy have failed to demonstrate that it is a form of hemorrhagic septicemia, as considered probable by investigators at the Colorado Station (E. S. R., 41, p. 286). A walking disease of horses on farms in the Walla Walla Valley appeared to be due to worms of the genus Cylicostomum in the large colon and cecum.

The present status of so-called cottonseed injury, S. A. Goldberg (*Cornell Vet., 13 (1923), No. 2, pp. 77–82*).—This is a review of the present knowledge of the pathology of this affection. The immediate cause of death as a result of cottonseed injury is pulmonary edema.

Influence of an artificial peroxidase upon the growth of anaerobic bacilli, O. T. Avery and H. J. Morgan (*Soc. Expt. Biol. and Med. Proc., 21 (1923), No. 2, pp. 59, 60*).—The suggestion previously noted (E. S. R., 50, p. 879), that the ability of anaerobic bacteria to grow aerobically in the presence of plant tissue may be due to the destruction by the oxidases of the tissue of the peroxids formed by the bacteria, has been substantiated by the observation that ferrous sulphate, precipitated with gum arabic in alcohol, can be substituted for fresh potato tissue. The iron is considered to act in a manner analogous to that of plant tissue in the destruction of toxic peroxids.

Studies on serologic classification of Bacillus botulinus.—I, Preparation of antiserum, P. Schoenholz and K. F. Meyer (*Jour. Infect. Diseases, 32 (1923), No. 6, pp. 417–420, figs. 2*).—The authors report that, with few exceptions, antiserum of high titer has been produced in rabbits by the intravenous inoculation of washed and heated cultures of *B. botulinus*. The method of preparing the cultures used for inoculation and of immunizing the animals is described, and data are given on the production of agglutinins in the serum at stated periods following the inoculation.

It is stated in conclusion that the observations of Bronfenbrenner, Schlesinger, and Calazans (E. S. R., 46, p. 670) that *B. botulinus* Type A can be differentiated from Type B by agglutination tests have been confirmed, although occasional high cross-agglutinations have been encountered. By means of agglutinin and agglutinin absorption tests it has been found possible to subdivide the A types into at least three and possibly four groups and the B types into at least two groups.

The microorganism of contagious abortion (Bacillus abortus) vaccinates man and the monkey against the microorganism of Mediterranean fever (Micrococcus melitensis) [trans. title], É. BURNET (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 1, pp. 154–156*).—The results are reported of the inoculation of two monkeys and two human subjects with killed, followed by living, cultures of *B. abortus* and the subsequent inoculation of all of the subjects with living cultures of *M. melitensis*. The first of the two monkeys did not react to *B. abortus* nor to *M. melitensis*. The second reacted to the two inoculations only by the production of agglutinins. The two human subjects also reacted to both microorganisms by agglutinin production. These experiments are thought to furnish proof that *B. abortus* is not pathogenic for man nor the monkey, and also that living cultures of this organism immunize both against Mediterranean fever.

Investigations on the precipitating, agglutinating, and complement binding action of blackleg serum, M. TODOROVITSCH (*Untersuchungen über die Präzipitierende, Agglutinierende und Komplementbindende Wirkung des Rauschbrandserums. Inaug. Diss., Hyg. Inst. Med. Fakult. Univ. Bern, 1922, pp. 34*).—In this dissertation the author reports an examination of the sera of various animals immunized against blackleg in the investigations of Gräub and Zschokke (E. S. R., 45, p. 180), Zschokke (E. S. R., 47, p. 880), and Uchimura (E. S. R., 45, p. 580).

In none of the sera used, which included sera from a horse, two sheep, and several guinea pigs, could the presence of specific precipitins, agglutinins, and complement-fixing bodies be detected in any appreciable amounts. A list of 46 references to the literature is appended.

Foot-and-mouth outbreak, F. M. HAYES (*Calif. Countryman, 10 (1924), No. 3, pp. 5, 24*).—This includes a brief discussion of the occurrence of the disease in California, where it was first reported from Alameda County on February 18, 1924.

On drug resistance of trypanosomes with particular reference to arsenic, C. VOEGTLIN, H. A. DYER, and D. W. MILLER (*Jour. Pharmacol. and Expt. Ther., 23 (1924), No. 1, 55–85, figs. 2*).—This is a report of investigations at the hygienic laboratory of the U. S. Public Health Service, which have led to the following conclusions:

"The study of drug resistance is of the greatest theoretical and practical interest. The arsenic resistance of trypanosomes is but a special case of adaptation of protoplasm to an injurious environment and is a purely relative term, relating to the concentration of a poison which a given strain can tolerate. The arsenic resistance of trypanosomes can be increased by inoculating animals which have received some time previously arsphenamin. This increase in resistance persists for a very long time and may be considered as a permanent and more or less specific change of the parasitic protoplasm. The degree of resistance can be established in the living animal host or in vitro, provided that a directly toxic arsenical is used in the latter case.

"The arsenic resistance can be reduced temporarily by passing a given strain through another mammalian host (rabbit, dog). Rabbit serum has no appreciable trypanocidal action. There is no difference in the virulence of strains with widely different arsenic resistance. Virulence has, therefore, no relation to arsenic resistance. It is feasible to isolate a strain of higher from a strain of lower arsenic resistance in the living mammalian host by treatment with a proper dose of an arsenical. A greater arsenic resistance reveals itself (1) in a more slowly declining action curve after injection of the drug into the host, (2) by a greater minimum effective dose, and (3) by a longer persistence of motility when the parasites are exposed in vitro to the action of arsenoxid. The detoxifying effect of certain sulphydril compounds on the arsenoxid action can be demonstrated on trypanosomes of a high degree of arsenic resistance as well as on so-called 'normal' strains. Ehrlich's chemoceptor theory is far too simple to explain the intricate mechanism of resistance. A working hypothesis is suggested which is based on the action of arsenic on the dynamic equilibrium, of which glutathione is a component and which regulates the respiration of protoplasm."

The paper includes a list of 30 references to the literature.

Bovine tuberculosis, M. H. Reynolds (*Minn. Univ. Agr. Ext. Spec. Bul. 81 (1923), pp. 16, figs. 8*).—This is a practical summary of information.

A study of some factors influencing fertility and sterility in the bull, H. L. Gilman (*N. Y. State Vet. Col. Rpt., 1921–22, pp. 68–126, pls. 12*).—The investigations here reported have led to the following conclusions:

"The genital organs of the bull quite frequently undergo pathological changes, due to infection with the same varieties of microorganisms associated with genital infections in the female. In all probability, these microorganisms are frequently eliminated with the semen and infect the female during copulation. Past or present infection in the genital organs of all the bulls so far examined was evidenced by the presence of the fine connective tissue tufts and strands upon the tunica vaginalis, particularly that part covering the tail of the epididymis. Lowered sexual capacity is, as a rule, accompanied by demonstrable changes in the semen. A study of the impotency and sterility includes not only a thorough study of the genital organs, but also those extrinsic factors which govern reproduction either directly or indirectly. A thorough knowledge of the anatomy and physiology of the male genital organs is fundamental to a clear understanding of the problem."

A bibliography of 48 titles is included.

Report of the section of animal pathology, E. T. Hallman (*Michigan Sta. Rpt. 1922, pp. 167–170*).—In continuation of work reported in Technical Bulletin 54, previously noted (E. S. R., 47, p. 83), the author reports briefly upon post-mortem findings of three head of cattle from a herd in which abortion and sterility had been a serious problem for several years.

The influence of low temperatures and of disinfectants on the eggs of Ascaris lumbricoides, E. B. Cram (*Jour. Agr. Research [U. S.], 27 (1924), No. 3, pp. 167–175*).—Investigations conducted by the U. S. D. A. Bureau of Animal Industry, the details of which are presented in part in tabular form, show that fresh and partially developed eggs of *A. lumbricoides* are so resistant to low temperatures that subsequent development occurs even after the longest periods of exposure (1) with fresh eggs for a 40-day period at below 0° F. temperature (—2 to —16°), and (2) with partially developed eggs for a 20-day period at the same temperatures.

"The life of the embryos that developed in these eggs was in both cases relatively short, but in the second case their infectivity for guinea pigs was demonstrated. Developed embryos in *A. lumbricoides* eggs were killed by a 20-day exposure to such temperatures (—6 to —17°), but not by a 10-day period at the same temperatures nor by even a 30-day exposure to freezing temperatures above 0° (12 to 18°). It is therefore evident that while very low temperatures may have a destructive effect upon the vitality of Ascaris eggs, many eggs under natural conditions are likely to survive severe winter weather, and the cold of winter can not be depended upon to destroy the vitality of Ascaris eggs present in pens, pastures, stables, etc. It does, however, diminish their infectivity in the course of time and may aid in controlling infection by a mechanical action in holding eggs in frozen soil and thus inaccessible to swine.

"Both an aqueous 5 per cent carbolic acid solution and 3 per cent cresol in a compound soap solution (U. S. liquor cresolis compositus) destroyed the capability of development in fresh and partially developed eggs and destroyed the activity of developed embryos. This was accomplished in 10 hours by the first disinfectant and in 5 hours by the second, when the eggs were completely immersed in the liquids. Under conditions as nearly analogous as possible to those in sanitary pens in which pigs are kept, the efficacy of the disinfectants was assured if the mixture of eggs and sawdust was thoroughly raked over and sprayed four times on each of two consecutive days. From these results it appears that phenol and cresol disinfectants may prove of value in helping to destroy Ascaris infection in pens and buildings under special conditions. The mechanical action of thorough scrubbing and cleaning and the heat of scalding water which should be used in cleaning are of great importance in the destruction of Ascaris eggs, and the destructive action of chemicals alone should not be expected to replace these measures."

A list is given of 11 references to the literature cited.

The value of the agglutination and complement fixation tests in equine paratyphoid abortion, E. Lehnert (*Der Wert der Agglutinationsprüfung und Komplementbindungsmethode beim Paratyphusabortus des Pferdes. Stockholm: Vet. Bakt. Staatsinst., 1922, pp. 88, pls. 4*).—The material for this extensive study of serological reactions in equine paratyphoid abortion was obtained during the course of an epidemic of infectious equine abortion occurring in Sweden in 1920. The report includes a review of the literature on the disease, an outline of the methods used, and a detailed report of the investigation itself, which is summarized as follows:

Cultures to be used for the test should not be over 24 hours old and grown at 37° C. Agglutinin titers of 1:400 and 1:600 are occasionally found in normal animals, but a titer of 1:800 only in infected animals. The content of normal agglutinins is lower in geldings than in mares and higher in old than in young animals.

In 75 paratyphoid-free horses, 9 immunized against streptococcus, staphylococcus, and glanders, and 16 suffering from various diseases, no complement-fixing substances could be detected in 0.5 cc. of serum. In 0.6 cc. of serum there was a 2+ fixation in a few normal cases.

Immune agglutinins appear at the time of or a few days after abortion but seldom before foaling, but complement-fixing substances have been detected before, on the day of, and a few days after abortion. In 11 of 33 cases in which there was no bacteriological diagnosis of equine abortion, imune agglutinins could not be detected. In 12 similar cases the complement fixation reaction was negative. In 6 cases with negative bacteriological diagnosis immune agglutinins were found, and in 3 of these cases complement-fixing bodies. These various failures are attributed to the form of the disease and to irregularity in agglutinin formation at different periods.

In the infected animals the agglutinin titer ranged from 1:800 to 1:1,600. Positive agglutinin tests were obtained with 42 per cent of the stallions, 61 per cent of the mares, and 38 per cent of the geldings. Positive agglutinin tests were obtained with 85 per cent of aborting mares. The highest agglutinin titer obtained was 1:64,000 and the highest complement fixation titer 0.002. In the majority of cases there was an agreement in the results obtained by both tests, but the complement fixation test failed more frequently than the agglutination test.

In 3 paratyphoid-free horses vaccinated at intervals of from 8 to 10 days with increasing doses of 2, 4, and 8 cc., the agglutinin titer reached a value of 1:4,000 and the complement fixation test a value of 0.05. Among the vaccinated naturally infected horses the highest agglutinin titer obtained during the period of vaccination was 1:16,000.

Immune agglutinins could be detached in the paratyphoid-free horses 3.5 months after vaccination. Complement-fixing substances disappeared in one case 4 months after the third injection, and in the other two cases about a month earlier or before the appearance of agglutinins.

In infected horses both agglutinins and complement-fixing bodies disappeared in three cases within 3.5 months after the period of vaccination. There was an earlier disappearance of the reaction following the vaccination of infected than of noninfected horses.

Parasites of dogs and cats of Oklahoma, J. E. Guberlet (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *1923, III, pp. 71–78*).—This is a report of observations by the parasitologist of the Oklahoma Experiment Station. His autopsies of 50 dogs and 30 cats showed 90 per cent of the dogs and 85 per cent of the cats infested with worms of one or more species. A list is given of 12 references to the literature cited.

Vaccination of fowls and rabbits against fowl cholera [trans. title], C. Cernaianu (*Compt. Rend. Soc. Biol.* [*Paris*], *90* (*1924*), *No. 7, pp. 528, 529*).—The author has employed with success in the vaccination of domestic fowls against fowl cholera a heated vaccine prepared by the Pasteur Institute of Serovaccines of Bucharest. The vaccine is injected intramuscularly in 1 cc. doses for fowls and 2 cc. for geese and turkeys, the injection being repeated in 8 days. The disease is said to be arrested in from 4 to 5 days after the first injection.

Equally good results have been obtained with a vaccine prepared by heating at 60° C. for one hour an emulsion in physiological salt solution of an agar culture of the organism. The immunity becomes evident in 4 or 5 days and lasts from 3 to 5 months.

A similar immunity has been produced in rabbits by two subcutaneous injections of the heated vaccine, although there is no evidence of agglutinins in the blood of the vaccinated animals.

Avian diphtheria and contagious epithelioma [trans. title], L. Panisset and J. Verge (*Compt. Rend. Acad. Sci.* [*Paris*], *177* (*1923*), *No. 23, pp. 1249–1251*).—The authors are of the opinion that avian diphtheria exists in two forms, acute and chronic. The acute form may be of the epithelial, pseudomembranous, or inflammatory or catarrhal type. Experiments are reported in which the pseudomembranous and catarrhal types have been reproduced by virus of the epithelial type and vice versa. These experiments are thought to prove that avian diphtheria and contagious epithelioma are identical.

Immunity in avian diphtheria and contagious epithelioma [trans. title], L. Panisset and J. Verge (*Compt. Rend. Acad. Sci.* [*Paris*], *178* (*1923*), *No. 3, pp. 345–347*).—It is reported that the inoculation in the barb of fowls of two drops (0.1 cc.) of an attenuated epithelial virus protects the fowls against the experimental inoculation of the virus of avian diphtheria in different places. This shows that the local or cutaneous immunity results in a general immunity. The immunity thus secured lasts for at least four months.

[Investigations of poultry diseases at the Delaware Station], C. C. Palmer (*Delaware Sta. 135* (*1924*), *pp. 14, 15*).—Bacteriological investigations of 86 antogenic vaccines prepared for roup and pox outbreaks resulted in the isolation of 11 distinct organisms. An extensive outbreak of enteritis among Delaware flocks, chiefly among older birds but also encountered in young chicks, was found to be due to *Bacterium coli communis* (E. S. R., 49, p. 482).

Diseases of baby chicks, F. R. Beaudette (*New Jersey Stas., Hints to Poultrymen, 12 (1924), No. 6, pp. 4, figs. 2*).—This popular account discusses white diarrhea, leg weakness, and coccidiosis, emphasizing some points that are often overlooked.

RURAL ENGINEERING.

Second biennial report of the Commissioner of Drainage and Waters, E. V. Willard (*Minn. State Dept. Drain. and Waters Bien. Rpt. 2 [1921–22], pp. 56*).—This report covers the activities of the Department of Drainage and Waters of the State of Minnesota for the 2-year period ended June 30, 1922. It contains data on main drainage outlets, draintile investigations, topographic and hydrographic surveys, Red Lake and Minnesota River flood control investigations, and statistics on drainage work.

The lower Gila region, Arizona, C. P. Ross (*U. S. Geol. Survey Water-Supply Paper 498 (1923), pp. XIV+237, pls. 23, figs. 16*).—This report gives general information in regard to the geography, geology, and hydrology of the lower Gila region in Arizona and includes specific information regarding desert watering places and routes of travel.

The Salton Sea region, California, J. S. Brown (*U. S. Geol. Survey Water-Supply Paper 497 (1923), pp. XV+292, pls. 19, figs. 18*).—This is a geographic, geologic, and hydrologic reconnaissance of the Salton Sea region in southeastern California and includes a guide to routes of travel and desert watering places. It was prepared in cooperation with the State department of engineering.

Flow of water through sluices and scale models, H. E. Hurst and D. A. F. Watt (*Engin. and Contract., Water Works, 61 (1924), No. 4, pp. 784, 785*).—In a paper presented before the Institution of Civil Engineers, London, experiments conducted at the Assuan Dam with six models of a sluice made to scales of 3 to 200, 1 to 50, and 3 to 100 in wood, wood and metal, and metal are reported. The head of water used was to the same scale as the model.

The general result was that if *n* denotes the ratio of the linear dimensions of the actual sluice and of its model and Q and *q* their discharges under corresponding conditions $Q=n^{\frac{5}{2}}q$. When the experiments were arranged in groups of six according to head and opening, the maximum departure of the mean of any group from this relation was 5 per cent when the sluice opening was running full and was not acting as a weir. Excluding flow under weir conditions, the mean departure for all models was 0.4 per cent and the mean departure, disregarding sign, was 1.5 per cent. Lower velocities occurred with flow under weir conditions, and, although at the higher heads the above relation held, as the head and velocity decreased a point was reached below which the relation was rapidly departed from. On the models used this point occurred with a head of about 3 cm. (1.18 in.) above the sill of the sluice. Below this head the discharge of the models rapidly decreased relatively to that of the actual sluice.

Experiments were conducted after roughening the surface of one model with coatings of sand of two grades of fineness. The mean diameters of the grains were estimated at 0.25 and 0. 5 mm. On the average the effect of these coatings was to reduce the discharge by 3.5 and 6 per cent, respectively, but the effect varied with the head and the amount of opening of the sluice gate.

It is concluded that models can be used to determine the discharge of large sluices with an average accuracy as good as that obtainable by current meter measurements.

[Irrigation studies at the Irrigation Substation], R. P. Bean (*Washington Col. Sta. Bul. 180* (*1923*), *pp. 68, 69*).—Tests of water penetration and distribution from furrows on land having a slope of 0.2 ft. per 100 ft. and on land with a slope of 6 ft. per 100 ft. showed that on the former water penetrated to a depth of 4 ft. in 48 hours, while on the latter it penetrated only 3 ft. in 72 hours. The rate of lateral distribution was about proportional to the downward penetration in each case. In the station soil the lateral and downward movements of water from a furrow were nearly equal for the first 12 to 24 hours, after which the lateral movement slowed down to almost nothing in from 36 to 48 hours.

An experiment to determine whether or not cultivation of corn need continue after the soil is well shaded by the crop showed that silage yields and moisture conditions were both slightly better on uncultivated plats.

Report on the pump irrigation at Chaungu (Sagaing) for the year 1921–22, Maung Ba Gyaw (*Rangoon, Burma: Govt., 1923, pp. 7, pl. 1*).—Tabular and graphic data on pumping for rice irrigation at Chaungu (Sagaing) are presented and briefly discussed.

A study of the relationship between the oxygen-consuming power of water and its hydrogen-ion concentration, F. W. Fabian and W. L. Mallmann (*Michigan Sta. Rpt. 1922, pp. 199–202*).—Studies of samples of water obtained from wells in the vicinity of the station showed that the H-ion concentration decreased upon standing and the oxygen-consuming power and bacterial count first increased and then decreased. There seemed to be no relationship between the H-ion concentration and the oxygen-consuming power, although a relationship did seem to exist between the number of bacteria present and the oxygen-consuming power.

Sand bed studies at Montebello water filters, Baltimore, I, II, J. R. Baylis (*Engin. News-Rec., 92* (*1924*), *Nos. 13, pp. 516–522, figs. 9; 14, pp. 563–568*).—This report is in two parts.

In part 1 observations of the individual sand grains of a sewage filter with a camera lucida are reported. These disclosed a gelatinous coating, the thickness of which affected the efficiency of the filter. Cracks, mud balls, and clogged places were found to be due largely to the loose settling of the filter after washing and to subsequent settlement while filtering. An excessive gelatinous coating around the sand grains caused the loose settling.

After several years of close physical and microscopic examination of the sand and experiments in the operation of the filters, it was found that the removal of a portion of the gelatinous coating by direct jet action of wash water applied through perforated pipes near the sand surface maintained the beds in a satisfactory condition during summer and winter. Due to the excess of the gelatinous film a larger sand grain was found to be preferable in summer, but in winter the film grew less vigorously and a smaller grain was desirable. The proper mean was found to be about 0.6 mm. The size, composition, and other characteristics of the grains had little influence on the thickness of coating formed if there was no force tending to remove it, but the size had a great effect upon the settlement. Due to abrasion in washing, size greatly affected the amount of coating that was retained on the grains.

The remedy for such troubles as the pulling away of the beds from the side walls, the formation of cracks and clogged places, and bacterial growths, when the proper size of sand was used, was found to be to prevent the formation of an excessively thick gelatinous coating or organic incrustation around the sand grains.

Part 2 contains discussions of the report by H. E. Babbitt, P. Burgess, J. W. Ellms, C. M. Daily, W. Donaldson, J. B. Hawley, W. F. Langelier, D. H. Maury, L. Metcalf, and F. H. Waring.

Design of concrete structures, L. C. URQUHART and C. R. O'ROURKE (*New York and London: McGraw-Hill Book Co., Inc., 1923, pp. IX+452, figs. 190*).—This is a textbook on concrete and reinforced concrete, in which the theory of design involved is developed with illustrative problems and complete designs of the essential features of the more common concrete structures are presented. Chapters are included on plain concrete; general properties of reinforced concrete; beams and slabs; bending and direct stress; columns; stresses in continuous beams and building frames; foundations; reinforced-concrete buildings; retaining walls; arches; slab, beam, and girder bridges; and forms.

Some research features involved in a study of the wooden fence post as a structural timber, R. W. TRULLINGER (*Agr. Engin., 5 (1924), No. 3, pp. 59–62, fig. 1*).—An analysis is given of the requirements imposed upon the wooden fence post as a structural timber as a basis for its development, and especially for the increase of its durability. The necessity for laboratory studies of the mechanical and physical properties of fence posts of different sizes, shapes, and types of woods, based upon the requirements imposed upon them in actual service is emphasized. Attention is also drawn to the necessity for close cooperation with wood technologists in matters relating to the causes for deterioration and their prevention.

Some power studies through use of the Ohio recording belt dynamometer, G. W. MCCUEN (*Agr. Engin., 5 (1924), No. 3, pp. 51–55, figs. 13*).—The substance of this report has been previously noted from another source (E. S. R., 50, p. 588).

What the farmer wants is an all-purpose tractor, D. C. HEITSHU (*Chilton Tractor and Impl. Jour., 12 (1924), No. 3, pp. 5–7, figs. 8*).—In a contribution from the Virginia Polytechnic Institute an analysis is given of the requirements governing the use of tractors on farms, with particular reference to conditions in Virginia. It is pointed out that, while the farmer must be able to cultivate with power, the ordinary plowing type of tractor does not reduce the labor peaks nor the number of work animals required.

Tabular and graphic data are presented which indicate that for Virginia conditions the general utility tractor of medium size should absorb all peak loads, give a better distribution of horse labor, reduce the required number of work stock, and work more days per year.

Subsoil plows [trans. title], M. RINGELMANN (*Jour. Agr. Prat., n. ser., 40 (1923), No. 49, pp. 454–458, figs. 5*).—Important points for consideration in the development of subsoil plows are enumerated and discussed, special reference being made to the influence of soil dynamics on the draft of subsoiling implements and to the importance of preventing subsoil material from coming to the surface.

Stationary spray plants, O. M. MORRIS (*Washington Col. Sta. Pop. Bul. 125 (1924), pp. 3–20, figs. 9*).—Practical information is given on stationary spray plants.

Power plant electrical equipment (*Chicago: Tech. Pub. Co., 1923, pp. 96, figs. 56*).—This publication contains chapters on general principles of direct current generators and motors, starting and stopping direct current generators, armature and field windings, operation of direct current generators and motors, locating faults and making repairs, principle of alternating current generators, location and care of alternating current generators, alternating current motors, synchronous motors, motor generators and converters, and transformers and their connections.

Electric service for rural districts, G. C. Neff (*Agr. Engin., 5 (1924), No. 3, pp. 56, 57, fig. 1*).—A brief analysis is presented of different methods used in rural line development where rural customers are served as individuals. It is pointed out that the chief obstacle to the more rapid extension of electric service to farm communities from central stations lies in the small amount of energy which the average farm consumes.

A brief review of electric light in greenhouse culture, H. Findlay (*Market Growers Jour., 34 (1924), No. 5, pp. 31–35, 36, figs. 3*).—Data from different sources on the use of electric light in greenhouse experiments are summarized, and the results of studies conducted at Columbia University with such vegetables as string beans, peas, sugar corn, cabbage, tomatoes, celery, lettuce, and onions under the influence of 500-watt, 110-volt, nitrogen-filled Mazda clear lamps are reported.

Marked increases of growth were noted in plants treated with artificial light plus sunlight over plants grown under sunlight alone. It is noted that the average temperature of the plants under the lamps was 22° F. higher than that of the plants under sunlight only, and it is thought that this heat had much to do with the rapid growth of the plants.

It is not recommended that vegetable growers invest in such equipment at this time owing to the fact that the work is still in an experimental stage. The opinion is expressed that the economic value of this process to commercial growers depends on the cost of engineering the project and in maintaining the installation at maximum efficiency to bring the evident effect of the artificial light on production.

Boilers, furnaces, and boiler accessories (*Chicago: Tech. Pub. Co., 1923, pp. 112, figs. 46*).—Chapters are contained in this publication on essentials of furnace operation, testing the correctness of combustion, sampling and determining the quality of fuel, furnaces for coal, mechanical stokers, powdered coal and fuel oil for boilers, boiler operation, types and characteristics of boilers, and recent practice in boiler operation.

Piping for power and heating plants (*Chicago: Tech. Pub. Co., 1923, pp. 128, figs. 77*).—Chapters are contained in this publication on installation of piping systems, construction of pipe joints, pipe fittings and bends, expansion in piping, materials used for piping, corrosion of piping and its prevention, radiation losses from pipes, pipe capacities and friction losses, water piping systems, steam piping—mains and headers, piping connections to power plant equipment, and piping for exhaust steam heating systems.

Refrigeration plant equipment (*Chicago: Tech. Pub. Co., 1923, pp. 94, figs. 34*).—This publication contains chapters on mechanical refrigeration and mediums, refrigerating and ice-making systems, ammonia compressors and their operation, construction and care of ammonia condensers, direct expansion for refrigeration, brine used as refrigerating medium, water handling in the ice plant, and construction and care of ice tanks.

Air leakage through the openings in buildings, F. C. Houghten and C. C. Schrader (*Jour. Amer. Soc. Heating and Ventilating Engin., 30 (1924), No. 2, pp. 121–134, figs. 11*).—Studies conducted by the U. S. Bureau of Mines in cooperation with the American Institute of Architects and the American Society of Heating and Ventilating Engineers on the leakage of air through and around a double-hung window, 2 ft. 8 in. by 5 ft. 2 in. by 1⅜ in., in a 13-in. brick wall plastered on the inside with cement plaster, are reported.

In preliminary tests it was found that leakage through the window consists of (1) that which passes through the cracks around the sash perimeter which are subject to weather stripping, (2) that which passes through the cracks between the frame and the brick and can be eliminated by calking under the staff bead or brick mold, and (3) that which passes through other cracks in the frame or sash and which can not be eliminated by either weather stripping or calking.

The wall under a 15-mile wind allowed the passage of 0.111 cu. ft. of air per minute, while the leakage through the window and frame for the same wind velocity was 47.5, 9.7, and 7.8 cu. ft. per minute for the plain window and two types of weather stripping, respectively. The area of the window and frame was 16.25 sq. ft., giving a leakage of 2.82, 0.597, and 0.48 cu. ft. per minute per square foot of window without and with the two types of weather stripping. Based upon these figures the leakage through the window and frame varied from 4 to 28 times that through the same area of wall. When the usual greater area of wall over that of window in considered, it is evident that the leakage into a room is usually greater through the wall than through the window if weather-stripped, and not many times less if not weather-stripped.

A comparison of the heat loss through windows and walls by transmission and leakage showed that under a 15-mile wind there was a heat loss of 2,580, 527, and 423 B. t. u. per hour through the window without and with two types of weather stripping, respectively, for a 50° temperature difference. The heat loss through the wall was 6.03 B. t. u. per hour. The heat loss as thus indicated by infiltration is 43 per cent as great as the heat loss by transmission.

An improved method of determining the heat transfer through wall, floor, and roof sections, R. F. NORRIS, H. H. GERMOND, and C. M. TUTTLE (*Jour. Amer. Soc. Heating and Ventilating Engin., 30 (1924), No. 2, pp. 109–114, fig. 1*).—This method is outlined in detail.

Wall plaster: Its ingredients, preparation, and properties (*U. S. Dept. Com., Bur. Standards Circ. 151 (1924), pp. 66*).—This paper reports an attempt to collect and correlate information about the factors which enter into successful plastering.

RURAL ECONOMICS AND SOCIOLOGY.

[Papers read before the American Farm Economic Association, December, 1923] (*Jour. Farm Econ., 6 (1924), No. 1, pp. 1–123, figs. 5*).—Certain of the papers noted before (E. S. R., 50, p. 198) are published here, as follows: A National Agricultural Program—A Farm Management Problem, by H. C. Wallace (pp. 1–7); Business Economics—An Opportunity for Agricultural Colleges, by T. P. Cooper (pp. 8–19); Courses in Marketing, by H. C. Taylor (pp. 20–27); An Attempt to Forecast the Future Trend of Farm Prices, by G. F. Warren (pp. 28–40); Effect of Business upon Agriculture, by R. W. Babson (pp. 41–60); The Use of Detailed Cost Studies in Improving Farm Organization in a Community, by G. A. Pond (pp. 69–84); The English Land Situation, by J. I. Falconer (pp. 85–105); and The Commodity Cooperative Association—Its Strength and Weakness, by H. E. Erdman (pp. 106–123); together with the paper by Leitch noted below.

Interpretation to the farmer of cost of production data, A. LEITCH (*Jour. Farm Econ., 6 (1924), No. 1, pp. 61–68*).—This paper was presented before the American Farm Economic Association (E. S. R., 50, p. 199).

The author raises the issue of the allocation of joint and opportunity costs, rent, and interest in farm cost accounting, and offers the following suggestions:

(1) That management and risk be generally dropped from cost calculations. (2) That interest and rent costs be kept at the lowest known long-term net rates on the safest class of securities. (3) That interest charges arise only out of those accounts which disclose a large amount of specialized investment. (4) That the accounting system isolate all interest elements in the account of each separate product or service, and that the direct interest charge in each produce account be separately stated. (5) That the accounting system make a reasonably complete separation of paid labor from operator's and unpaid family labor. (6) That in preparing a schedule of the costs of any produce the following order be generally observed: (a) Direct cash costs attributable to the product; (b) interest, rent, and depreciation attributable to the product; (c) opportunity cost of other marketable home-grown products used; and (d) joint costs including in order, cash expense; home-grown products not otherwise marketable, straw, etc.; operator's labor; use of horses, farm equipment, and buildings; and interest, rent, and depreciation jointly incurred. (7) That in each separate product account the term cost be applied to all items appearing in the above schedule except joint costs. (8) That the items appearing under joint costs in the above schedule be designated, as far as that product is concerned, desirable net revenue or desired producing profit, or any other suitable term that would indicate that there are elements of profit in these joint costs. (9) That the itemized product costs schedule as above outlined be paralleled by a product revenue schedule, showing the actual amount contributed by that product to the joint cost fund, or the desirable net revenue fund, or the desired producing profit fund. (10) That the several contributions of the various product accounts to the joint cost fund be brought together in an account.

A method of testing farm-management and cost-of-production data for validity of conclusions, H. R. TOLLEY and S. W. MENDUM (*U. S. Dept. Agr., Dept. Circ. 307* (*1924*), *pp. 13, figs. 5*).—This publication sets forth the application to farm management and cost of production data of methods of analysis developed in other lines of research for the specific purpose of giving quantitative expression to the relationships of the widely variable characteristics frequently observed.

The first and simplest of these analytical devices and one which gives the maximum return for the minimum of effort is the double frequency table and its graphic representation, the "dot chart" or "scatter diagram." In making the scatter diagram or correlation chart the position of any dot representing an observation is determined by reference to its numerical value on two scales, one horizontal, the other vertical, at the intersection of the two values projected.

This gives a qualitative solution of the relationships between the variables, and a quantitative measure of the degree of relationship is needed. The correlation coefficient is said to be such a measure, and the method of computing the coefficient of correlation is illustrated and the procedure set forth step by step. Such factors as size of farm, expenses, receipts, rate of production of cows per farm or per cow, amount of labor, amount of capital, and others enter into labor income from the farm. The correlation of each of these with labor income is measured by the size of the correlation coefficient, and their relative importance in the body of data being analyzed is indicated. By an extension of the same methods, the combined effect of two or more of these factors on labor income (or on any other factor) may be computed and the most logical points for attention in reorganization or cost studies may be brought out.

The regression line or "line of best fit" and the regression coefficient are, respectively, the graphic and numerical expressions of the differences between the group averages and the amount of change in one variable associated with a given change in another. The regression line illustrated in this discussion is a straight line drawn through the intersection of the average lines on a correlation chart or scatter diagram in such a way that half the observations fall on each side of it. The regression coefficient is said to be computed roughly by dividing the vertical movement of the regression line by the horizontal movement in terms of their respective scales, and a number of formulas are presented and applied to farm analysis data.

Report of the farm management section [of the Michigan Station], H. M. ELIOT (*Michigan Sta. Rpt. 1922, pp. 218–225*).—Data are submitted in a preliminary way from a study of the tractor as one of the units in farm investment. A summary is presented of the cost of keeping 245 horses on 46 farms in Jackson, Shiawassee, and Lenawee Counties for the year ended March 31, 1922, likewise of the average money yield, direct costs, and net returns on 254 cows on 23 farms in Jackson and Shiawassee Counties for the same period. The money yields, direct costs, and net returns of poultry on 39 farms in Lenawee, Jackson, and Shiawassee for the same period are also tabulated and briefly discussed.

[Report of the Washington Station] division of farm management, G. SEVERANCE (*Washington Col. Sta. Bul. 180 (1923), pp. 32–37*).—Three studies are reported upon in a preliminary way, the first one being a two-year study of the cost of milk production and dairy farm organization in Spokane and Stevens Counties, Wash. This was begun in April, 1922, to supplement the data previously noted (E. S. R., 48, p. 591).

A study of the factors affecting organization on the irrigated farms in Yakima County was begun during the latter part of the summer of 1922, the U. S. Department of Agriculture and the station cooperating. Complete farm records were secured from 72 farms on the Indian reservation in the neighborhood of Toppenish, Wash., and 103 farms off the reservation situated between Toppenish and Sunnyside. The average yields of sugar beets on these farms were low, being 7 tons per acre on the reservation and 3.6 tons per acre outside of it. The other crop yields were normal, alfalfa giving 4 tons per acre on the reservation and 4.6 tons outside of it, and potatoes 9.9 and 8.6 tons per acre, respectively. Prices received by individual farmers had much to do with the very poor average returns. Sugar beets averaged $6 per ton, baled hay $9.03 per ton, and potatoes $20 per ton.

The field work for a study of the financial returns from farming in the logged-off uplands in western Washington was carried on in the fall of 1922 in cooperation with the U. S. Department of Agriculture. Data were gathered to determine the relative adaptability and economy of different methods of clearing land, the net returns from different types of farming, the financial progress made by settlers, the best methods of procedure in developing a logged-off land farm, the present organization and management of farms, and the possibilities of improving this and increasing the profits. The survey was confined to the Everett gravelly, sandy loam types of upland soils of King and Pierce Counties, and complete records were secured from 150 farms for the year 1921. All types of farms were found to be too small on the average either to bring in an adequate volume of business or to be equipped for economical operation. Poultry and fruit farms were shown to be the most profitable of the specialized types, and a combination of poultry and fruit, poultry and dairying, or all three lines on farms of good size is recommended. The present cost of raw land plus the cost of clearing exceeds the producing value of the land. A study of the financial history of 166 settlers indicates that the increase in net worth is due largely to increase in land values.

Land settlement in the Argentine Republic, J. C. VALÁRDEZ (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 2, pp. 227–248*).—Private efforts in the direction of land settlement in Argentina are described, as well as Government measures of more recent years. The land settlement activities of agricultural organizations and particularly of the Jewish Colonization Association are noted.

The cultivation of allotments in England and Wales during the war, F. L. TOMLINSON (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 2, pp. 162–210*).—A brief history is given of the origin and development of the allotment movement in England and Wales. The general characteristics of the movement immediately before the war, the methods by which land was provided for allotments, and the extent of the allotment movement are set forth. The activities during the war period are taken up in greater detail.

The income of tenants on a Scotch open-field farm in the eighteenth century, I. F. GRANT (*Econ. Jour., 34 (1924), No. 133, pp. 83–89*).—In an old farming account book dated 1769–1779 has been found an indication of the earnings and living conditions of the smaller subtenants on a good farm of about 416 acres of arable land in Badenoch, a district in northern Scotland. The quantity of grain sown and the number of livestock customarily kept on the various types of holdings are noted. A croft of 13 to 17 acres is said to have given fairly full employment, due to the tedious and primitive systems of farming followed. In addition certain services were required by the proprietor. The tenants endured hardships and existed on a low standard even on this, which was an especially productive farm.

Share tenancy in Rumania, C. J. SISESTI (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 2, pp. 211–226*).—Serfdom was widespread in Rumania in the seventeenth century. The land reforms of the middle of the nineteenth century were inadequate, and the peasants became more and more dependent upon the landlords and their terms of tenure more and more burdensome until in 1908 a series of laws was passed intended to improve tenure relations and to give more effective protection to peasant cultivators. The only form of share tenancy maintained thereafter was that of cultivation on the basis of sharing produce. The policy of protection for the peasant class and of regulation of the tenure of land reached its culmination in the agrarian reform of 1919, and is based on the expropriation which has been carried out in the last four years.

Cotton and the cotton market, W. H. HUBBARD (*New York and London: D. Appleton & Co., 1923, pp. XII+503, figs. 3*).—The problems of cotton cultivation and of combating the boll weevil are set forth, and in connection with the marketing of cotton the author describes the warehouses and compresses in the South, the various southern merchants and other buyers, and the methods of carrying on the future contract business of the New York, New Orleans, and Liverpool exchanges. The matter of hedging as a protection against market risks is presented in the third of the four sections, and in the last speculation is discussed in general and from the standpoint of the individual trader and of the community.

The marketing of wheat in Maryland, S. H. DEVAULT (*Md. Univ. [Agr.], Ext. Bul. 30 (1923), pp. 46, figs. 7*).—The information contained in this report is the result of an investigation which was conducted during the summer of 1923 to determine the present methods of marketing wheat in Maryland, the principal market for Maryland wheat, the facilities for receiving grain from boats and trucks in Baltimore, the quantity delivered, the price received, comparative freight rates, the present financial status of wheat farmers in Maryland, and the present evils in marketing, with proposed remedies.

Commercial grading and packing of tomatoes, F. L. HARKEY and D. D. WHITCOMB (*Clemson Agr. Col. S. C., Ext. Bul. 59 (1924), pp. 15, figs. 11*).—Suggestions are drawn up on harvesting, grading, packing, and loading tomatoes.

Commercial harvesting, grading, and marketing of peaches in South Carolina, F. L. HARKEY and C. A. OWENS (*Clemson Agr. Col. S. C., Ext. Bul. 60 (1924), pp. 23, figs. 15*).—Working directions and definitions of grades are furnished.

Crops and Markets (*U. S. Dept. Agr., Crops and Markets, 1 (1924), Nos. 9, pp. 129–144; 10, pp. 145–160, fig. 1; 11, pp. 161–176; 12, pp. 177–192, fig 1; 13, pp. 193–208*).—Abstracts of current market information, notes on the position in the market of important classes of crops and livestock, tabulations of weekly receipts and prices with summaries and comparisons, and brief notes presenting outstanding features of the market situation for the week are given in these numbers. Miscellaneous brief foreign crops and markets notes are included.

The new legislation on chambers of agriculture in Germany, H. DADE (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 2, pp. 151–161*).—The principles followed in the modification of the chambers of agriculture already in existence in Germany and the establishment of others in the States where none existed prior to the war are set forth here. The legislation relating to them is briefly reviewed.

State of Alabama agricultural code, 1923 (*Montgomery: State, 1923, pp. [2]+152*).—The text is given of an act completely reorganizing the State control work with agriculture in Alabama.

Measures taken to facilitate agricultural cooperation in the United States, L. S. TENNY (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 2, pp. 249–256*).—The cooperative marketing law of February, 1922, and other Federal and State measures are noted, and the scope and extent of agricultural cooperation in the United States are set forth briefly.

[Agricultural organizations in Canada] (In *Second Report on Organization in Industry, Commerce and the Professions in Canada. Ottawa: Dept. Labor, 1923, pp. 49–70*).—Annotated lists of agricultural, dairying, and horse and livestock breeders' associations and cooperative societies of agriculturists, fruit growers, dairymen, and others have been compiled, giving the names and addresses, respective chief executive officers, and the objects in so far as possible.

Report of the Irish Agricultural Organization Society, Ltd., for the year ending March 31, 1922, T. A. FINLAY ET AL. (*Irish Agr. Organ. Soc. Rpt., 1922, pp. 137*).—This annual report brings up to date the series previously noted (E. S. R., 48, p. 391).

Readings in economics for China, C. F. REMER (*Shanghai: Commercial Press, Ltd., 1922, pp. X+685, figs. 2*).—Information with respect to economic conditions in China has been compiled in the effort to provide material that will make possible the comparison of the East with the West and of one eastern country with another. A number of the excerpts included relate specifically to rural conditions in the eastern countries, as The Economic Transformation of Rural India, by R. Mukerjee; Eastern Agricultural Methods, by F. H. King; The Future for Livestock in China, by C. O. Levine; and The First Agricultural Lecture Train in China, by H. K. Tong.

The restoration of agriculture in the famine area of Russia, trans. by E. and C. PAUL (*London: Labour Pub. Co., Ltd., 1922, pp. 167*).—This is a symposium constituting the interim report of the State Economic Planning Commission of the Council for Labor and Defence of the Russian Socialist Federal Soviet Republic. The various reports set forth the agricultural characteristics of southeastern Russia, the improvements in methods and farm organization which are deemed necessary, some of the possible subsidiary industries, and the public works found there.

[Crop conditions, yields, and farm values on the North Platte Reclamation Project], J. A. Holden (*U. S. Dept. Agr., Dept. Circ. 289 (1924), pp. 3–8*).—Statistics of crops and livestock applying to the interstate unit of the North Platte Reclamation Project in Nebraska for 1920 and 1921 are tabulated and discussed. A summary is given of acreage, yields, and farm values of the principal crops grown on this project from 1910 to 1921, inclusive, and notes are furnished as to the state of development of livestock industries.

Montana statistical history of agriculture, annual crop and livestock review for 1922, G. A. Scott and C. D. Greenfield, jr. (*Mont. Farm Rev., 1 (1922), pp. 79, figs. 20*).—This is the first publication of this kind relating to Montana agriculture and is issued cooperatively by the U. S. Department of Agriculture and the Montana State Department of Agriculture.

Monthly Supplement to Crops and Markets (*U. S. Dept. Agr., Crops and Markets, 1 (1924), Sup. 3, pp. 81–112, figs. 2*).—The agricultural outlook for 1924, planting intentions for 1924, a summary of agricultural production for 1923, and certain phases of foreign agricultural production and world agriculture are treated in special articles. Production statistics with reference to crops, livestock and livestock products, dairy and poultry products, fruits and vegetables, grains, and seeds are variously reported. The cold storage holdings report for March 1 is given, and farm prices and price movements are tabulated and charted.

[Agricultural statistics for Germany] (*Statis. Jahrb. Deut. Reich., 43 (1923), pp. 39–53*).—Official statistics of agriculture, forestry, fisheries, and animal production on farms are given for recent years, but principally for 1921 and 1922.

Making the country weekly more attractive, M. V. Atwood (*N. Y. Agr. Col. (Cornell) Ext. Bul. 69 (1923), pp. 30, figs. 15*).—Practical suggestions are made with reference to headlines; the choice of type; the arrangement of heads, features, and local illustrations; and other details in the make-up of the country newspaper.

AGRICULTURAL EDUCATION.

Agricultural education [and] miscellaneous experimental and educational schemes (*[Gt. Brit.] Development Commrs. Rpt., 13 (1923), pp. 52–74*).—A report is made of expenditures from the development fund for new buildings and equipment and courses of instruction at the agricultural colleges in Great Britain, as well as extension work and special lectureships. The programs of work for numerous experimental farms are noted.

The re-organisation of rural education in the Cape Province of the Union of South Africa, J. R. Malan (*Diss., Columbia Univ., New York, 1922, pp. VI+168, figs. 3*).—The present school system of the Cape Province is described historically and from the point of view of administrative organization; school classification; support; inspection and supervision; school grounds; buildings, and equipment; the teaching force; school attendance; and the medium of instruction. It is found to be highly centralized, and rural education particularly is said to be handicapped by lack of local adaptation, initiative, and sense of responsibility.

A questionnaire was prepared in connection with a seminar in the rural department of the Teachers' College of Columbia University and addressed to the secretaries of school boards in the Cape Province. They were requested to distribute them to rural teachers in farm schools, one and two teacher primary schools and three and more teacher schools. Inquiries were made as regards the pupils, the teachers, boarding places, the course of study, the school and its care and equipment, inspection, and the community, and the opportunity was given for comment and suggestions. Of the 375 questionnaires returned to New York from South Africa, 350 were used in this study.

The urgent need of more expert supervision is recognized. It is proposed that two instructors be employed on the staff of such normal schools as are in a position to give rural school practice for the purpose of preparing teachers for the one-teacher rural schools, providing professional help for rural teachers in service, developing leadership for rural education, and encouraging productive scholarship in this field.

Suggestions are made with reference to vitalizing and motivating the course of study, giving it greater thought content and relieving the overemphasis on the product and manual skill. Other recommendations cover methods of teaching and testing; building, grounds, and equipment; the general improvement of the one-teacher school; consolidation and transportation; rural high schools; continuation schools, part-time education, and extension teaching; and the rural community. An extensive bibliography is given.

Some results of eight years of vocational training in Indiana, B. J. Burris (*Ind. Dept. Pub. Instr. Ed. Bul. 61* (*1922*), *pp. 50, figs. 46*).—This publication is submitted to acquaint the public with the aims and purposes of certain phases of vocational training, together with the work accomplished, 1914–15 to 1921–22, inclusive.

High school departments of vocational agriculture (*N. Y. State Univ. Bul. 770* (*1922*), *pp. 34, fig. 1*).—This publication treats of the organization and administration of a high school department of vocational agriculture. It sets forth requirements for State and Federal aid, qualifications of teachers, and the composition of the advisory board, and offers practical suggestions with regard to courses of study, equipment, and other details.

The relation of the high school to home economics education, G. A. Works (*Vocat. Ed. Mag., 2* (*1924*), *No. 7, pp. 559–562*).—Certain problems of home economics education in the small high school are discussed. The conclusion is drawn that at present instruction in home economics does not have the time emphasis in the high school program that its importance warrants. It is held that the large opportunity for serving the needs of high school girls is during the freshman and sophomore years, and it is deemed wise for the small high school to so organize its work that home economics courses do not extend beyond the second year. Furthermore a period of one hour is deemed advisable, since the longer periods of from an hour and a half to three hours leads to the relative overemphasis of the manual phases of the subject to the neglect of technological aspects.

Organization and administration of homemaking courses in evening vocational schools, H. S. Sweetser (*Vocat. Ed. Mag., 2* (*1924*), *No. 7, pp. 565–568*).—It is deemed important to appoint as the director of evening home-making classes the woman who is in charge of day classes. A demand for short unit courses covering 10 or 15 lessons is recognized. Special training classes for teachers, conferences, the use of the lesson sheet, methods of effective advertising, enrollment of students, and the importance of regular attendance are set forth.

A State fair program in vocational agriculture, R. H. Thomas (*Vocat. Ed. Mag., 2 (1924), No. 7, pp. 538–540, figs. 3*).—This is a description of the combined display of the vocational agricultural schools of North Carolina at the State fair in 1923, the purpose of which was to convey to the public the results of work being done by the agricultural departments of the State.

Farm management extension: Early development and status in 1922, H. M. Dixon (*U. S. Dept. Agr., Dept. Circ. 302 (1924), pp. 27, figs. 11*).—Those methods of extension teaching in farm management which are discussed here include farm management schools, single-period discussion meetings or lectures, farm tenancy committees and conferences, selected area demonstrations over a period of years, work with boys and girls, local community organizations or clubs, community analysis surveys, exhibits, farm management tours, farm business survey demonstrations, the analysis of account books and enterprise cost records, and general publicity means. A statistical summary of farm management extension in 1922 includes the leading lines of activity in which farm management demonstrators are engaged, indicating the results achieved in each.

Statistics of cooperative extension work, 1923–24, E. Merritt (*U. S. Dept. Agr., Dept. Circ. 306 (1924), pp. 22*).—Current statistics compiled from budget statements by the State agricultural colleges are summarized, continuing a series of reports, an earlier one of which was previously noted (E. S. R., 48, p. 692).

Agricultural problems, R. T. Ely et al. (In *Outlines of Economics. New York: Macmillan Co., 1924, 4. rev. ed., pp. 579–596*).—The topics treated in this chapter of a revision of an earlier text dealing with general economics are the trend of the size of farms, the proper size of farms, tenancy and ownership, farm indebtedness and agricultural credit, farm labor, the marketing of farm products, and speculation. A list of 25 references is given.

Introduction to agricultural economics, L. C. Gray (*New York: Macmillan Co., 1924, pp. XII+556, figs. 81*).—A textbook for beginning students is offered in which attention is first directed to systems of farming as determined by physical, economic, and social conditions. The ten succeeding chapters are devoted to those subjects commonly included in the field of farm management, and following these the problems associated with land, capital and credit, and labor are treated. Marketing processes, market organization, prices, and economic cooperation among farmers are presented in conclusion. Considerable graphic material is included. Questions on the text, special problems, and suggested readings are given at the conclusion of the chapters.

Selected list of Government publications on foods and nutrition, compiled by R. Van Deman (*U. S. Dept. Agr., Bur. Home Econ., 1923, pp. 1+29*).—A multigraphed list of the available Government publications on foods and nutrition which are considered the most useful are arranged under 74 subjects and briefly annotated.

MISCELLANEOUS.

Report of the director for the year ending October 31, 1923, W. L. Slate, Jr., et al. (*Connecticut State Sta. Bul. 254 (1924), pp. 141–159*).—The work of the station is briefly summarized by departments. The experimental work recorded is for the most part abstracted on page 127 in this issue.

Annual report of the director for the fiscal year ending June 30, 1923, C. A. McCue et al. (*Delaware Sta. Bul. 135 (1924), pp. 48, fig. 1*).—This contains the organization list, a report of the director including a financial statement for the fiscal year ended June 30, 1923, and departmental reports. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report [of Georgia Station], 1923, H. P. Stuckey (*Georgia Sta. Rpt. 1923, pp. 33–57, figs. 3*).—This contains the organization list, a report by the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

[Thirty-fifth Annual Report of Michigan Station, 1922], R. S. Shaw et al. (*Michigan Sta. Rpt. 1922, pp. 159–672, figs. 165*).—This contains a financial statement for the year ended June 30, 1922; reports of the director and heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue; and reprints of Technical Bulletins 52–56 and Special Bulletins 107–116, all of which have been previously noted.

Report of Northwest Experiment Station, Crookston, 1922, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1922, pp. 101, figs. 26*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of West Central Experiment Station, Morris, 1922, P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1922, pp. 55, figs. 5*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report [of the] Delta Branch Experiment Station, 1922 and 1923, W. E. Ayres (*Mississippi Sta. Bul. 221 (1924), pp. 15*).—The experimental work reported is for the most part abstracted on page 134 of this issue.

Progress of agricultural experiments, 1923, [J. C. Kendall] (*New Hampshire Sta. Bul. 212 (1924), pp. 38*).—This contains the organization list, a report of the director on the work of the station, and a financial statement for the fiscal year ended June 30, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-third Annual Report [of Washington College Station], 1923, E. C. Johnson et al. (*Washington Col. Sta. Bul. 180 (1923), pp. 80*).—This contains the organization list, a report on the work of the station during the year, and a financial statement for the fiscal year ended June 30, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-third Annual Report of [Wyoming Station, 1923], J. A. Hill (*Wyoming Sta. Rpt. 1923, pp. 43–74, fig. 1*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1923, a report of the director on the work of the station, and meteorological observations by F. E. Hepner (see p. 115). The experimental work reported is for the most part abstracted elsewhere in this issue.

The work of the Scottsbluff Experiment Farm in 1920 and 1921, J. A. Holden (*U. S. Dept. Agr., Dept. Circ. 289 (1924), pp. 38, figs. 6*).—This report includes a summary of meteorological observations from 1911 to 1921 (see p. 115), a review of agricultural conditions on the project, and a report of the work on the experimental farm during 1920 and 1921. The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES.

Arizona University and Station.—F. J. Crider, professor of horticulture and horticulturist, has resigned to become director of the Boyce Thompson Southwestern Arboretum at Superior.

California University and Station.—Dr. W. H. Boynton has been appointed professor of veterinary science and veterinarian, beginning July 1. It is expected that he will make a study of hog cholera vaccines.

Mississippi College and Station.—At the last session of the legislature, a bill was passed requiring all State institutions, whether supported wholly or in part from State funds, to submit monthly to the Governor and State auditor a report showing for each employee the number of hours' work performed each day and the nature of the work, as well as the itemization of all expense accounts. A uniform account bill was also passed for all State institutions, and a third bill which requires monthly a list of expenditures as a basis for receiving money to pay outstanding obligations.

Although no other State institutions received any increase in appropriations, and in most cases there were reductions, the appropriations for the station were increased $22,450 for the ensuing biennium. The increase was largely for the Delta Substation, which is granted $50,050 in addition to $7,500 for a cotton gin. The main station will receive $47,500, the Raymond Substation $18,000, the South Mississippi Substation $31,600, and the Holly Springs Substation $33,000.

Nebraska University and Station.—R. F. Howard, chairman of the department of horticulture, has resigned to engage in private work and will be succeeded September 1 by Dr. C. C. Wiggans, associate professor of horticulture and associate horticulturist. Other appointments include Ernest L. Reichart, a 1924 graduate of the Kansas College, as instructor in dairy husbandry and creamery manager; Benjamin Masurovsky as instructor in dairy husbandry, beginning September 1; and L. K. Crowe as graduate assistant in dairy husbandry.

Cornell University.—Dean A. R. Mann of the College of Agriculture has been granted leave of absence for two years to be spent in Europe in organizing efforts to promote agricultural science and education through an international exchange. This mission is under the auspices of the International Education Board and contemplates exchanges of selected persons engaged in agricultural science and education and in highly important public services to agriculture in order to enable them to spend time in study and investigation in countries, other than their own, whose experience in similar fields may contribute to their own ability to deal with the work in which they are engaged. The organizing of this work and the initial undertakings are to be arranged by Dean Mann, and are expected to involve contacts with all the Governments and the scientific institutions and societies engaged in agriculture in the several countries of Europe. His initial headquarters will be established in Rome.

Texas Station.—The legislature has discontinued its recent practice of closely itemizing and restricting the station appropriations. The latest measure contains only three items, one of $68,060 for salaries at the main station, $70,940 for general expenses of the main station divisions and soil survey, the agronomy experiment farm, beekeeping investigations, experimental apiaries, and foul brood eradication service, and $105,000 for general expenses at substations, including the purchase of lands. This change is expected to result in greatly improved administrative efficiency.

Wisconsin University and Station.—Work has been started on a new beef cattle barn at the University Farm. This is to be a wooden building 108 ft. long, 40 ft. wide, and 38 ft. high in the center. Cattle will be stabled on the first floor in 12 large box stalls, and 6 or more single stalls will be provided, the total capacity of the barn being about 45 cattle. The first floor will also contain feed bins and a small office and record room, and the second floor will provide space for storing roughage and grain. The building will cost, with equipment, approximately $14,000.

The annual Beef Cattle Feeders' Conference was held at the livestock pavilion May 17. The results of an experimental feeding trial, in which alfalfa hay has been compared with clover hay as a supplement to a ration of corn, cottonseed meal, and corn silage for six months, were presented, likewise the results of trials carried on to determine economical rations for baby beef production.

The third annual Rural Church and Social Workers' Conference took place at the college from June 30 to July 11. Provision was made for librarians in this conference for the first time.

A 2-day Indian farmers' institute was held recently at Keshena on the Menominee Reservation by the county agent of Shawano County and the agronomy department, with about 400 Indians in attendance. For the past nine years the members of this tribe have cooperated at the institutes held on the reservation, as well as in home demonstrations and boys' and girls' clubs.

A conference of station workers and others interested in the problems of producing canning peas in Wisconsin was held at the college May 28. Among the problems facing this industry are the root rot disease, the pea louse, and questions of fertilization and inoculation. A new canning pea, known as the Horal and which has been produced at the Ashland Substation, is said to be relatively resistant to the root rot disease, and enough of this seed will soon be available to permit canners to give it a trial. Thirty canning companies have contributed to a fund for studying the pea root rot problem, and M. B. Linford has been appointed to carry on field and laboratory work on the subject during the coming year under the direction of the department of plant pathology.

The sum of $600 has been placed at the disposal of the college by the flax development committee, representing oil, paint, and various other manufacturers, for use in conducting field experiments with flax as a companion crop with small grains. This year a total of over 150 such plats will be tried at Madison, Wauwatosa, River Falls, Ashland, and Marshfield.

Thirty-six cooperative test plats of soy beans with 17 varieties have been arranged in 22 Wisconsin counties for this season by county agents and the agronomy department in cooperation with the U. S. Department of Agriculture.

The experimental electric line for the purpose of studying the application of electricity to agriculture in Wisconsin, previously referred to (E. S. R., 50, p. 800), has been located southwest of Ripon, extending for six miles from the city limits. Eight farmers and two pea viners have agreed to cooperate in this work, and five or six other farmers are expected to join the enterprise in the near future. The lines were expected to be completed in June.

U. S. Department of Agriculture.—The Forest Service is planning to establish an additional forest experiment station in the Pacific Northwest on a par with those opened in 1923 in the Lake States and Northeastern regions, as well as to enlarge materially the research work under way in the southern pine region. Thornton T. Munger has been appointed director of the northwestern station.

Dr. Paul E. Howe, associate in the department of animal pathology of the Rockefeller Institution at Princeton, N. J., has been appointed biological chemist in the animal husbandry division, Bureau of Animal Industry, beginning June 16, and will have charge of the nutrition investigations in animal husbandry.

Dr. David Fairchild has been awarded the silver-gilt medal of the French Ministry of Agriculture in recognition of his service in the field of plant introduction.

In recognition of his services to Chilean agriculture, the decoration "Al Mérito" has been conferred by the President of Chile upon Wilson Popenoe.

Dr. George K. K. Link of the Bureau of Plant Industry has been appointed associate professor of plant pathology in the University of Chicago.

Rural Education at the Sixty-second Annual Meeting of the National Education Association.—In addition to a report on Rural Teachers' Problems presented by H. W. Foght to the first business session of the representative assembly, two sessions were held by the rural education section of the National Education Association in its meeting at Washington, June 29 to July 4, under the chairmanship of J. M. Foote. The topic of the first meeting was Rural Education, a Field of Service for the Women of America. The speakers were Miss F. Hale, Mrs. J. F. Sippel, Mrs. J. B. Cleaver, and K. M. Cook. Miss Hale set forth the opportunities for service and for professional attainments on the part of young women teachers in the field of rural education. The next speaker dealt with the work of women's clubs in the way of broadening the vision of women in the country and developing their opportunities and demands for education and more social life. Closer cooperation between rural teachers and members of women's clubs was urged. Mrs. Cleaver's paper dwelt upon the experiences of parent-teacher associations, particularly in Delaware, where much has been accomplished in the way of improving rural schools and rural education. In the last paper the future was forecasted from the national viewpoint, and the past efforts of Federal and State Governments, together with plans projected for the improvement of the educational opportunities of the rural child, were briefly outlined.

The second session had for its general topic Contributions of Rural Education to the National Life. C. J. Galpin discussed the relative importance to the Nation of the education of the farming group, pointing out the economic importance of the farm population to national life in that since the farm can not use its share of adults over 21 years of age while the city uses 12.9 per cent more of adults than it rears, the farm must and does supply them. Furthermore, the farmer furnishes to the city dweller his food and much of his raw material and is a heavy consumer of the goods manufactured in the city. The educator was said to be in a position to play an important rôle as a propagandist for the arts and culture and the goods produced in the city. J. E. Butterworth discussed the numerous sources of teaching materials in country life and the opportunities afforded for object lessons. At the conclusion of this paper a moving picture was exhibited, showing a country life conference held at Whitmell Farm Life School, a consolidated agricultural school near Danville, Va. A brief address by U. S. Commissioner of Education J. J. Tigert ended the program.

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RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Fat chemistry and fat industries in the years 1919 to 1922 [trans. title], A. GRUN (*Chem. Ztg., 47 (1923), Nos. 131–132, pp. 817, 818; 133–134, pp. 825, 826; 137–138, pp. 838–841; 139–140, pp. 845–847; 143–144, pp. 857–861; 145–146, pp. 865–867; 149–150, pp. 877–881; 151–152, pp. 885, 886; 155–156, pp. 897–901*).—A brief review is given of the statistics of the fat industry in Germany in 1913 and 1922 and of the literature for 1919–1922 on the following topics connected with fats: Physico-chemical investigations, colloidal studies, studies on the constitution of fats and waxes, synthesis and isolation of new fats, the biochemistry of fats, analytical methods, fat production, food fats, hydrogenation, hardened oils, fat decomposition, and the preparation of fatty acids and soaps.

The deterioration of edible fats, J. F. BEVIS (*Jour. Soc. Chem. Indus., 42 (1923), No. 43, pp. 417T–420T*).—In this study of the factors responsible for the development of rancidity in fats, pure beef and mutton fats rendered at a temperature of from 54 to 71° C. from the caul and kidneys were subjected to various treatments and examined subsequently for rancidity by the Kreis colorimetric test and the oxidation method of Issoglio, both as modified by Kerr (E. S. R., 39, p. 313). Determinations were also made of free fatty acids, as oleic, and of the iodin and saponification numbers.

To determine the effect of aeration at different temperatures, air freed from carbon dioxid and water was passed through the fat in suitable containers placed in water baths at 50 and at 100°, while control flasks were kept at the same temperature without aeration. At the end of 4 hours the Kreis test was negative for both aerated and unaerated samples at 50° and positive at a 1 in 30 dilution in the aerated and at 1 in 3 dilution in the control fat at 100°. Corresponding values for the Issoglio test were 1.9, 2.4, 27.5, and 5.4, respectively. The only significant changes in the other values were in the aerated fats at 100°, which showed an increase in free fatty acids and in the saponification numbers and a decrease in the iodin numbers.

To determine the influence of time on aeration, samples of fat were heated at 100° and at 70° with and without aeration and tested at varying intervals. At a temperature of 100° the Kreis test was positive in the aerated sample at the end of 2 hours and in the control at the end of 3 hours. At 70° the first positive test appeared in 3 hours in the aerated and at 5 hours in the unaerated sample. The other tests applied to the samples heated at 100° for 3 hours and at 70° for 5 hours showed no significant changes at the lower temperature, but increased acidity and a decreased iodin number at 100°. The Kreis test proved more delicate than the Issoglio. The fact that a temperature of 100° without aeration was more effective than the lower temperature with aeration in promoting rancidity is thought to indicate a possible intramolecular change resulting in a more ready response to the action of air. Increased acidity is thought to point to hydrolysis and a decrease in the iodin value to an attack upon the unsaturated acids.

The final experiments were conducted upon samples of beef fat, to one of which had been added a few drops of oleic acid, to another a few drops of glycerin, and to another a little egg white. These were kept at ordinary temperature in diffused light for 180 days. An untreated sample was kept under the same conditions and another in the dark for the same length of time.

A comparison of the controls kept in the dark and in the light showed that light is an important factor in increasing rancidity and also free acidity. Of the treated samples, the one containing oleic acid showed the greatest change in the Kreis and Issoglio tests. The Kreis test was positive for 1 in 140 as compared with 1 in 50 for the untreated sample kept under the same conditions. There was not a corresponding change in free acidity, but in the sample containing egg albumin there was a marked increase in free acidity which was coincident with the appearance of mold. The glycerin appeared to have no effect. All of the samples gradually became bleached, this being the most pronounced in the sample containing oleic acid and the least in the one containing egg albumin. An acrid odor also developed in the majority of the samples.

Some factors affecting the keeping quality of whole milk powders, C. D. DAHLE and L. S. PALMER (*Jour. Dairy Sci., 7 (1924), No. 1, pp. 40–57*).—The factors studied in this investigation of the keeping qualities of three commercial brands of whole milk powders representing (1) the pressure spray system, (2) the centrifugal spray system, and (3) the drum system were the effect of the moisture content of the powders, the type of containers, the temperature of storage (4° C. refrigerator, 20° room, and 37° incubator), and time in storage (3, 6, 9, and 12 months).

In studying the first factor, the powders were spread out in flat pans and exposed for several hours at room temperature to an atmosphere nearly saturated with moisture and were then packed into opaque glass jars and stored for the varying lengths of time and at the different temperatures mentioned, after which they were scored for flavor and odor. All of the samples stored at room temperature and at 20° became unfit to use after 3 months. Of those stored in the ice box, (1) and (3) were in good condition after 3 months, but showed marked deterioration after 6 months. The most rapid deterioration took place in the samples which took up moisture to the greatest extent.

The types of containers used included small opaque glass jars with metal screw caps, Sealright paper containers, plain pasteboard containers, and Doubletite tin containers, both plain and lacquered. Those which permitted the entrance of air and moisture proved unsatisfactory, particularly when the samples were kept in the moist atmosphere of the ice box. The Doubletite tin containers proved the most satisfactory. Samples kept in these containers were practically unchanged after a year in storage, and did not show the discoloration which the other samples underwent at the high temperature. Lacquering the containers did not appear to increase the keeping qualities of the milk.

With the exception of the samples stored in the air-tight tin containers, most of the samples deteriorated very rapidly at 37°, but not much difference was noted between those stored at 4° and 20° except such differences as could be attributed to the increased moisture of the ice box. The effect of time on storage depended upon the type of container used and the temperature of storage, the time increasing the unfavorable effects of the other factors.

In discussing the relative keeping qualities of the samples prepared by the different processes, attention is called to another factor which could not be taken into consideration in the comparison, namely, the original quality of the milk. In the present experiment the keeping quality of the milk prepared by the pressure spray process was in general better than that prepared by the other two processes. This is attributed to the fineness of the particles of this particular powder, which permitted closer packing, with less access of air and moisture. The milk prepared by the drum process showed a tendency to leak fat on storage in pasteboard containers. This is attributed to the high temperatures used in the preparation of this powder.

Sublimation as an analytical procedure, J. Hortvet (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 481–489, figs. 4*).—Following a general discussion of the use of sublimation and microsublimation in various organic separations, a description is given of the construction and use of a sublimator devised by the author to meet the requirements of the various operations involved in sublimation processes.

Sublimation of plant and animal products.—Third report, A. Viehoever (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 473–481, figs. 4*).—This report includes illustrations of a microsublimation apparatus adapted to vacuum and cooling, a suction flask adapted to sublimation, a specially constructed sublimation flask devised by the author, and a micromelting point apparatus devised by B. J. Howard.

In the comments of collaborators on the use of the microsublimation apparatus, another apparatus slightly different from the one devised by the author is described by P. B. Clark, and an illustration of it is included.

The behavior of pumice stone during the dehydration of organic liquids, A. Seidenberg (*Jour. Assoc. Off. Agr. Chem., 7 (1923), No. 1, pp. 98–106*).—In connection with the comparative study of the pumice stone method and the author's gauze dish method of determining total solids (E. S. R., 50, p. 20), a study has been made of the manner in which pumice stone affects the organic residues distributed over it.

The increased tendency, following heating, of pumice stone or any substance consisting of small particles or having many capillary openings to absorb moisture from the air or from liquids spread over it is considered to be responsible for the irregular results obtained with it. If the pumice stone is heated to redness before being used, approximately constant weights may be obtained in moisture determinations, but these are due to two compensating errors, one, the gain in weight resulting from the absorptive power of the pumice and the other the loss in weight produced by the decomposition of the organic residues. If the pumice is dehydrated at the low temperatures used for the evaporation of the liquid, all of the water is not expelled, while if higher temperatures are used, it is considered impossible to secure a distinct end point which will distinguish between the loss due to the decomposition of the solid and that due to the evaporation of the liquid. The use of the author's gauze dish is thought to do away with these errors.

Quantitative determination of acetic anhydrid, G. C. Spencer (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 493–497*).—Previous methods for this determination are reviewed, and a volumetric method is described which is based upon the formation of acetanilid from the action upon acetic anhybrid of anilin dissolved in cold chloroform. The acetanilid is hydrolyzed with sulphuric acid and the resulting anilin sulphate titrated with N/2 or N/5 potassium bromate-bromid solution. The analytical results reported for the use of this method with a large number of samples indicate an accuracy within 1 per cent.

Studies of the activity of organic nitrogenous compounds, II, C. S. Robinson, O. B. Winter, and S. Bandemer (*Indus. and Engin. Chem., 15 (1923), No. 11, pp. 1179–1182, figs. 14*).—In this continuation of the investigation previously noted (E. S. R., 48, p. 821), the Official alkaline permanganate method for determining water-insoluble organic nitrogen in fertilizers was studied by conducting 12 different determinations on each of several samples of fertilizers, varying only the time and the temperature and analyzing the products of digestion in each case. The tubes in which the digestion was conducted were heated first on a water bath and withdrawn one at a time at intervals of 5 minutes after the first 15 minutes until 6 had been withdrawn. The remaining 6 tubes were transferred to an oil bath at 140° C. and withdrawn one at a time at intervals of 10 minutes. Similar determinations were made using alkali but no permanganate.

In the series of experiments in which alkali alone was used, the resulting ammonia was high and the amino nitrogen low, and the sum of the two was below that ordinarily found in protein material, thus indicating that the hydrolysis was incomplete. In the permanganate experiments, the amino nitrogen was almost negligible in amount and decreased as the digestion progressed, while the ammonia nitrogen increased. There was, however, a lack of agreement between the total amounts of the two, which is thought to point to a production of ammonia from other linkings.

A comparison of the amount of ammonia formed up to the taking of the first sample with that produced during the remainder of the digestion and distillation showed that by far the largest part was produced prior to the digestion even when only 15 minutes was allowed for the first stage. There was some difference in the rate of evoultion of ammonia from the different materials used, and also some indication that at the end of the process the reaction was in all cases still incomplete. A second criticism of the permanganate method, that with substances which decolorize permanganate different results are obtained than with those which do not, was also found to hold good in the method as applied.

It is concluded that the results obtained by the present method are no more reliable than those obtained by the Official method, but that the method is equally accurate and is considerably shorter. The following technique is recommended in preference to the Official method: "A sample containing 50 mg. water-soluble nitrogen as determined by the Official method is weighed into a 500-cc. Kjeldahl flask, the prescribed amount of alkaline permanganate solution added, and the flask connected with a condenser. A small flame under the flask is regulated so that about 100 cc. of distillate passes over in 45 mniutes. The distillate is caught in standard acid, and at the end of this time the excess is titrated. If the solution tends to foam a few drops of octyl alcohol may be added."

On the perchlorate method for the estimation of potassium in soils, fertilizers, etc., H. J. Page (*Jour. Agr. Sci. [England], 14 (1924), No. 1, pp. 133–138*).—In addition to the possible sources of error reported by Davis for the perchlorate method of determining potash (E. S. R., 29, p. 609), the author has discovered a hitherto unsuspected error in the possible presence in the perchloric acid of considerable amounts of chloric acid. In such cases the final precipitate consists of a mixture of potassium perchlorate, potassium and sodium chlorates, and some unchanged chlorids, instead of potassium perchlorate alone. A method of detecting the presence of chloric acid in perchloric acid is recommended as follows:

One cc. of the acid is diluted with 20 cc. of water, a few crystals of ferrous sulphate are added, and the liquid is boiled for a short time and then acidified with nitric acid and a few drops of silver nitrate added. If the original acid is free from chlorids no more than a faint turbidity should be produced.

Attention is also called to the custom suggested by Neubauer (E. S. R., 17, p. 731) of adding 0.5 gm. of pure calcium carbonate to soil extracts deficient in calcium carbonate, and data are reported showing that equally accurate results are obtained with the use of only 0.1 gm. instead of 0.5 gm., thus effecting a considerable economy in perchloric acid.

The differentiation of noodles made with whole egg from those made with yolk, R. Hertwig (*Jour. Assoc. Off. Agr. Chem., 7 (1923), No. 1, pp. 84–91*).—Analyses are reported of various flours, whole eggs, and egg yolks, and of noodles prepared with whole eggs and with egg yolks. As the best means of determining whether whole eggs or egg yolks have been used in the manufacture of the noodles, the author recommends the determination of the following ratios:

$$(1)\ \frac{\text{Alcohol-precipitable nitrogen} \times 100}{\text{Total nitrogen}};$$

$$(2)\ \frac{\text{Lecithin-phosphoric acid} \times 100}{\text{Alcohol-precipitable nitrogen}};\ \text{and}$$

$$(3)\ \frac{\text{Alcohol-precipitable nitrogen} \times 100}{\text{Fat, acid digestion method}}.$$

Of these ratios, the values for (1) are above one in whole egg noodles and below one in yolk noodles, for (2) are negative for whole egg and positive for egg yolk noodles, and for (3) positive for whole egg and negative for egg yolk noodles. For the determination of lecithin-phosphoric acid, the method described below is recommended.

Determination of lipoids and lipoid-phosphoric acid in flours, alimentary pastes, noodles, and eggs, R. Hertwig (*Jour. Assoc. Off. Agr. Chem., 7 (1923), No. 1, pp. 91–98*).—In the method described the material (if noodles or alimentary pastes) is first heated with 70 per cent alcohol on a water bath at from 75 to 80° C. to decompose the lecitho-proteins, to dissolve the protein gliadin, and to aid permeation of the fat solvent, and is then extracted in the cold for 2 minutes with 95 per cent alcohol, 5 minutes with ether dried over sodium, and 1 or 2 minutes with ether saturated with water, the last extraction being repeated three times. The combined ether-alcohol extract is evaporated to dryness on a steam bath, dried in an oven at 100° for 45 minutes, and finally dissolved in chloroform and filtered by suction. The dried extract from the chloroform, which is reported as lipoids, is saponified with 4 per cent alcoholic potassium hydroxid, evaporated to dryness, charred, and extracted with nitric acid to determine the phosphoric acid by the Official volumetric method.

In the method as adapted to dried powdered eggs and liquid eggs, the fat is first extracted with ether and in the case of liquid eggs with 95 per cent alcohol, and the method continued as above.

Report on determination of pectin in fruit and fruit products, H. J. Wichmann (*Jour. Assoc. Off. Agr. Chem., 7 (1923) No. 2, pp. 107–112*).—This report deals principally with a comparison of the Carré and Haynes method of determining pectin as calcium pectate (E. S. R., 47, p. 610) and the method of Wichmann and Chernoff [1] for determining it as pectic acid. It is concluded that the former method gives accurate results only with the use of great care in washing the precipitate, owing to the difficulty of removing calcium chlorid from the colloidal precipitate.

The discoloration, smut, or blackening of canned lobster, F. C. Harrison and E. G. Hood (*Canada Council Sci. and Indus. Research Rpt. 12 (1923), pp. 40, figs. 10; also in Roy. Soc. Canada Proc. and Trans., 3. ser., 17 (1923), Sect. V, pp. 145–189, pls. 2, figs. 12*).—In this report of an investigation of the causes of blackening in canned lobster, the conclusion is drawn that the chief cause is a chemical action occurring when the medium is alkaline, but that in some cases the discoloration may be due to bacterial action in improperly processed cans. The former can be prevented by the use of a pickle containing from 3 to 6 per cent salt and 3 oz. of either glacial acetic or citric acid to each gallon of the pickle. It is also recommended that the final washing of the lobster before canning be made with a dilute acid solution 1 oz. to the gallon. If this is done, 2 instead of 3 oz. of acid should be added to each gallon of the pickle. Darkening from bacterial action can be prevented by processing the cans at higher temperatures, from 240 to 245° F. for 35, 45, and 80 minutes, respectively, for ¼, ½, and 1 lb. cans.

Composition of commercial mustard seeds and the detection of added mustard bran in prepared mustard, R. Hertwig (*Jour. Assoc. Off. Agr. Chem., 7 (1923), No. 1, pp. 68–83*).—Analyses are reported of 43 commercial mustard seeds, 3 mustard brans, 1 mustard flour, 2 prepared mustards of known composition, and 15 commercially prepared mustards.

The maximum and minimum values for the seeds calculated on the fat, salt, acid-insoluble, ash-free basis were nitrogen 8.35 and 6.42, crude fiber 11 and 7.2, total P_2O_5 4.4 and 2.28, CaO 1.734 and 0.734, and MgO 1.326 and 0.616 per cent. The most notable differences in the composition of the bran as compared with the seeds were in the crude fiber, which was much higher, and in the MgO, which was lower than in the whole seeds. A better means of comparison than any one constituent was found in certain ratios between various constituents. The two ratios considered of chief value were as follows:

$$A=\frac{\text{CaO}\times\text{crude fiber}}{P_2O_5\times N}\text{ and }B=\frac{A}{\text{MgO}}$$

The maximum and minimum values for the whole seeds for A were 0.78 and 0.26 and for B 0.88 and 0.21. Corresponding values for two samples of English and one of Japanese mustard bran were for A 18, 16, and 5.9 and for B 48.2, 55.5, and 12.7, respectively.

The composition of the two prepared mustards did not differ markedly from that of the seeds used in their preparation. Of the 15 commercial mustards, 5 showed adulteration as determined by crude fiber and by the above ratios, while 2 others did not show adulteration from the standpoint of nitrogen and crude fiber alone but did from the various ratios. It is concluded that the nitrogen and crude fiber content of a prepared mustard alone is insufficient to detect adulteration with mustard bran in some cases, and that in the examination of prepared mustard suspected of containing added bran determinations should be made for solids, nitrogen, crude fiber, ether extract, acid insoluble ash, chlorids, total phosphoric acid, calcium oxid, and magnesium oxid.

Composition of commercial mustard brans with special reference to the detection of added mustard bran in prepared mustard, R. Hertwig and J. I. Palmore (*Jour. Assoc. Off. Agr. Chem., 7 (1923), No. 2, pp. 170–173*).—

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[1] Jour. Assoc. Off Agr. Chem., 6 (1922), No. 1, pp. 34–40.

The data in the above paper have been supplemented by analyses of 16 samples of commercial mustard brans. The maximum and minimum values calculated on the moisture and fat-free basis were as follows: Nitrogen 5.92 and 2.7, crude fiber 29.2 and 14.1; total P_2O_5 2.42 and 0.4, CaO 1.91 and 0.862, and MgO 0.792 and 0.266 per cent, respectively. The calculated values for ratio A were 52.3 and 1.3 and for ratio B 196.6 and 1.6, respectively.

These results are thought to confirm the conclusions of the previous paper, that small additions of bran to prepared mustard can be detected by calculations of these ratios.

A new sedimentation tube and its use in determining the cleanliness of drugs and spices, A. Viehoever (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 466–472, figs. 2*).—Descriptions with illustrations are given of two sedimentation tubes, one containing approximately 30 and the other 200 cc., which have been devised by the author at the Bureau of Chemistry, U. S. D. A., for use in determining foreign matter in drugs and spices. The method of using the tubes is described, and data on their use by various collaborators are reported.

Cryoscopy of milk, E. M. Bailey (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 429–434*).—Previously noted from another source (E. S. R., 50, p. 112).

A quantitative determination of the ammonia, amino nitrogen, lactose, total acid, and volatile acid content of cows' milk, H. Lisk (*Jour. Dairy Sci., 7 (1924), No. 1, pp. 74–82*).—Analyses are reported of 27 samples of commercial milk obtained from Baltimore dairies. The milk was sterilized by autoclaving before being used for the analyses. Ammonia was determined by the Shaffer modification of Boussingault's vacuum distillation method as further modified by Harris (E. S. R., 42, p. 271); ammonia nitrogen by the Van Slyke method with the solution prepared as described by Harris and also by the method of Denis and Minot (E. S. R., 40, p. 509); lactose by the method of Folin and Denis (E. S. R., 38, p. 615); total acidity by the titration of a 1:10 dilution with N/10 KOH, using phenolphthalein as indicator; and volatile acids by the steam distillation method of Dyer (E. S. R., 37, p. 13).

The results obtained for amino nitrogen by the Harris method varied from 10.17 to 46.27 mg. per 100 cc., and by the Denis and Minot method from 1.8 to 4.09 mg. per 100 cc. The latter figures are considered more accurate. The amount of lactose obtained varied from 2.93 to 5.29 per cent, the H-ion concentration from pH 6.4 to pH 6.6, total acidity from 12 to 32 cc. of undiluted milk, and volatile acidity from 0.7 to 2 cc. Acetic, butyric, and caproic acids were identified in the distillate. All of the samples gave off a volatile sulphid when subjected to steam distillation.

Comparison of the Roese-Gottlieb and Babcock methods of testing.—I, Individual samples. II, Factory control, A. O. Dahlberg (*Jour. Assoc. Off. Agr. Chem., 7 (1923), No. 2, pp. 159–169*).—A comparison is reported of the Babcock test and a modified Roese-Gottlieb test as applied to milk, cream, skim milk, and buttermilk. The modification in the latter test consisted in centrifuging the tubes after the various reagents had been added instead of allowing the contents to settle.

In tests with milk the official Babcock method gave with 32 samples an average of 0.1 per cent higher results than the Roese-Gottlieb method. In 34 tests with cream the results by the Babcock method were 0.13 per cent higher than by the Roese-Gottlieb. Slightly lower results were obtained with the Babcock test in the case of skim milk and buttermilk.

The comparison was extended to commercial conditions in two trials. The amount of fat in the milk used during each period was calculated from determinations made on samples taken from the milk in the vats after thorough stirring, and was compared with the actual yield of butterfat. During these periods 1,868.4 and 3,826.2 lbs. of butterfat were obtained from the milk, and with the Roese-Gottlieb tests all but 0.35 and 0.14 per cent, respectively, were accounted for, while on the basis of the Babcock tests 3.1 and 3.55 per cent of the total amount of butterfat for the two periods were not accounted for.

Methods for fat in malted milk and dried milk, J. T. KEISTER (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 435–437*).—Data are reported on fat determinations in malted milk by the so-called "neutral" Roese-Gottlieb method (E. S. R., 47, p. 314). A slight modification of the technique previously described was introduced, namely, the preparation of a 15 or 20 per cent water solution of the sample in place of weighing out 1 gm. of the sample. In the case of true malted milks a 15 per cent solution gave satisfactory results, but with samples of lower fat content a 20 per cent solution was preferable. The results obtained by this method were in most cases higher than those obtained by the regular Roese-Gottlieb method.

Data secured with the "turbidity point" of butterfat, A. SEIDENBERG (*Jour. Assoc. Off. Agr. Chem., 6 (1923), No. 4, pp. 437–440*).—The turbidity point test for the detection of foreign fats in butter (E. S. R., 39, p. 715) has been applied to cream.

To obtain the fat from the cream, about 200 gm. of the naturally soured cream was poured on a large filter and from 25 to 30 cc. of water added. This was allowed to drain from 12 to 14 hours at a temperature not exceeding 20° C., after which the filter paper was peeled off and the residue transferred to a small beaker and heated with frequent stirring in an oven at from 90 to 100° until the fat separated out. This was then filtered on cotton and used for the turbidity test.

In the examination of over 1,000 samples of cream by this method normal turbidity values as well as normal values for Reichert-Meissl number, Polenske number, and refractive index were obtained, but in certain of the samples the turbidity values were from 12 to 26 points beyond the limits of from 48 to 64 established for butter. In some of these samples the other values were within the limits accepted as normal, while in others the values were such as to suggest the possibility of adulteration. It is considered that the turbidity point "affords a valuable and in some instances necessary confirmation to the evidence supplied by the other values."

Detection of sterilized concentrated milk in mixtures with natural milk [trans. title], M.-E. POZZI-ESCOT (*Ann. Chim. Analyt., 2. ser., 5 (1923), No. 9, pp. 272–274*).—The method described is essentially a modification of the Evenson color test for remade milk (E. S. R. 47, p. 111). The technique employed by the author consists in diluting 25 cc. of milk with an equal volume of distilled water, coagulating the mixture by the addition of a little sulphuric acid, shaking, and centrifuging. The casein is washed several times with water until the wash water gives only a slight blue color with α-naphthol and sulphuric acid, and is then placed in a tube with a few cubic centimeters of 5 per cent sodium hydroxid and heated for a few minutes on the water bath. The intensity of the yellow color which develops is proportional to the amount of sterilized milk present.

Another test suggested involves the precipitation of the protein by metaphosphoric acid and the addition of Nessler's reagent to the serum. The serum of fresh milk is not colored, while that of sterilized milk becomes intensely yellow and is precipitated rapidly as a grayish-green precipitate.

Experimental data on pectin-sugar-acid gels, R. Sucharipa (*Jour. Assoc. Off. Agr. Chem., 7 (1923), No. 1, pp. 57–68, figs. 3*).—In the experiments reported in this paper jellies were prepared by adding varying amounts of a solution containing 75 per cent of sucrose and 0.75 per cent of citric acid to pectin solutions of known strength. In preparing such mixtures it was found that if the required amount of pectin was present and the solution was allowed to stand for a certain time a gel would be formed without heating. This and other significant points were brought out by filling two sets of four Erlenmeyer flasks with the same amount each of a mixture prepared by adding a definite weight of the sugar-acid sirup to one-third its weight of a 4 per cent pectin solution. Of each set of flasks one was left open, one stoppered, one stoppered and heated on a water bath at 50° C. for one-half hour, and one stoppered and heated at 100° for one-half hour. One set was placed in the ice box and the other left on the laboratory desk. On examination after four days the flasks kept in the ice box contained a firmer gel than the corresponding ones kept at room temperature. The gel in the open flask was firmer than that in the closed flasks. No difference could be noted between the contents of the heated and unheated flasks. These tests are thought to indicate that no chemical change is involved in the formation of gels, but that the setting is due to the insolubility or coagulation of the pectin in the liquid phase composed of sucrose, water, and acid.

This theory was substantiated by a study of the liquid and solid phases of different jellies. The phenomenon of "weeping" in jellies is considered to be due to the oozing out of the liquid from the solid. A gel containing 2 per cent of pectin was found to yield about 15 per cent of this liquid, which, however, could be obtained only by centrifugation. A gel made of the same pectin but containing only 0.75 per cent of pectin yielded more than 60 per cent of this liquid. To free the solid phase completely it was washed in 75 per cent alcohol and the residue from the alcohol after evaporation added to the liquid phase. The solid part was found to consist almost entirely of pectin, which on reprecipitation yielded a perfect gel when dissolved again in the proportion of 1 per cent in a sucrose acid sirup. The liquid part contained the acid and sugar of the original jelly, slight traces of pectin, and a small amount of methyl alcohol, which is thought to have resulted from the partial decomposition of the pectin.

A comparison was then made of the ash and methoxyl content and gel-forming properties of pectins prepared from the pulp and the albedo or white part of lemon peel, (1) by extraction of the albedo with cold water, (2) by extraction from pulp at a pressure of ½ atmosphere for 30 minutes, (3) by extraction from albedo at a pressure of ¾ atmosphere for 40 minutes, (4) by extraction from pulp at a pressure of 1 atmosphere for 60 minutes, and (5) by extraction from albedo at a pressure of 1½ atmospheres for 90 minutes. Each of these was further purified by precipitation with alcohol. The purified pectins had a higher methoxyl and a lower ash content than the corresponding crude pectins. The amount of methoxyl in the various pectins decreased in the order mentioned, and the jellying properties decreased in like order. It is concluded that the amount of pectin necessary to form a jelly depends upon its purity, its methoxyl content, and the method of preparation. It was further noted that the jellies made with the different pectins had quite different tastes, the first three giving jellies of ordinary taste and the others of a disagreeable gummy taste.

In testing for jellying strength two methods were used. One was to prepare jellies with varying concentrations of pectin, placing equal amounts in beakers and examining them after storage in the ice box for 24 hours. Those in which the gel separated from the glass wall and retained its shape on inclining the beakers were considered satisfactory. The other test involved the use of a gel tester devised by the author. This depended on the principle of determining the strength of the jelly by a breaking test, compressed air being used as the breaking force and the amount of pressure required recorded on a manometer. A diagram is given of the apparatus.

Industrial alcohol, J. G. McIntosh, rev. by H. B. Stocks (*London: Scott, Greenwood & Son, 1923, 2. ed., rev. and enl., pp. XII+400, figs. 91*).—This is a revision by H. B. Stocks of the first edition of this volume. The material includes two introductory chapters dealing with the principles involved in the preparation and testing of alcohol, followed by chapters on the methods of manufacturing alcohol from beets, grain, potatoes, wines, sugar cane and sugar-cane molasses, miscellaneous sources, and waste wood and sulphite cellulose liquors, the production of alcohol by synthetic processes, a manufacturing plant for distillation and rectification of industrial alcohol, the manufacture and uses of alcohol derivatives, statistics, and the various uses of industrial alcohol.

The chemistry of rubber, B. D. W. Luff (*London: Ernest Benn (Ltd.) 1923, pp. XI+12-232, pls. 16, figs. 12*).—This reference book, dealing chiefly with the chemical principles involved in the cultivation, collection, and manufacture of rubber, includes a historical introduction in which the steps leading up to the discovery of the principle of vulcanization are described briefly, descriptive chapters on the chief sources of rubber (wild and plantation), chapters on the composition and properties of rubber latex and crude rubber, the physical and chemical properties of pure raw rubber and methods of its synthesis, and several chapters dealing with vulcanization. The final chapter is devoted to methods of analysis of crude rubber, compounding ingredients, vulcanized rubber, and rubber-combined sulphur.

References to the original literature are given as footnotes, and the volume is abundantly illustrated with photographs.

The chemistry of paints, pigments, and varnishes, J. G. Bearn (*London: Ernest Benn, Ltd., 1923, pp. X+277, pls. 11, figs. 26*).—This volume is designed not only for those engaged in the various branches of the paint and varnish industry but also for analysts called upon to test the materials and architects and others who have to specify them for various protective uses. The subject matter is arranged in three parts, dealing, respectively, with paints, their composition, properties, and uses; the inorganic and organic pigments, their preparation and properties; and varnishes, lacquers, and japans. The volume is illustrated with photographs and diagrams of machinery and apparatus.

The utilization of slaughterhouse offal [trans. title], E. Césari (*Rev. Gén. Méd. Vét., 32 (1923), No. 381, pp. 485-505*).—The various uses to which edible and inedible offal of slaughterhouses may be put are discussed at length.

SOILS—FERTILIZERS.

Erosion and surface runoff under different soil conditions, F. L. Duley and M. F. Miller (*Missouri Sta. Research Bul. 63 (1923), pp. 5-50, figs. 22*).—Experiments covering a 6-year period are described, in which the amount of run-off and soil eroded were measured after each rain from seven plats having different cropping systems or tillage treatments. The plats, which were each $\frac{1}{80}$ acre in area, were elongated in form and ran up and down a slope averaging 3.68 ft. to 100 ft. Concrete tanks at the lower ends served to collect the run-off and eroded soil from each plat. Each plat was given a different treatment, which included (1) no cultivation with all weeds pulled, (2) 4-in. spading in the spring and cultivation after rains, (3) 8-in. spading in the spring and cultivation after rains, (4) blue-grass sod, (5) wheat annually, (6) a rotation of corn, wheat, and clover, and (7) corn annually.

The average run-off varied from 48.92 per cent of the rainfall on the uncultivated plat to 11.55 per cent on the blue-grass sod plat. The land spaded 8 in. deep in the spring absorbed only 2.9 per cent more rainfall than that spaded 4 in. This is taken to indicate that deep plowing of farm lands can be expected to have only a slight advantage over shallow plowing with reference to the absorption of rainfall.' Uncropped land, whether cultivated or uncultivated, absorbed much less water than grass or clover land. Land in a rotation of corn, wheat, and clover lost only 14.14 per cent of the rainfall as run-off. The surface inches of rainfall absorbed by uncropped land or by land growing a cultivated crop like corn was practically constant from year to year for a given soil condition, regardless of the wide variation in the annual precipitation. The absorption by sod, wheat, and rotated land was more variable.

The average annual rainfall for the six years of the experiments was 35.87 in. or 1.73 in. below normal. The seasonal distribution of rainfall was also somewhat below normal during the winter and summer months and above normal during the spring and fall months. The times of maximum run-off and erosion were during March, April, August, and September. On plats 2, 3, 4, and 6 more than 50 per cent of the erosion took place during August and September. The annual erosion from spaded land where no crop was grown was greater than from soil which was not stirred.

Deep spading reduced the loss from erosion only 13.4 per cent as compared with the shallow spading. This is taken to indicate that deep plowing is less effective in controlling erosion than is usually supposed. In addition, the total loss from the deep-spaded land without a crop was very high as compared with cropped land. The presence of a corn crop reduced the erosion of deep-spaded land by 50 per cent as compared with the uncropped land, wheat reduced it 81 per cent, and rotation 93 per cent. Sod land lost only 0.68 per cent as much soil as the uncropped soil spaded 4 in. deep.

A direct correlation of the amount of soil eroded with the number of heavy rains occurring during the year showed that the soil eroded during 16 of the most destructive rains in the six years under consideration was more than 50 per cent of the total erosion on five of the seven plats.

Chemical analyses showed that the amounts of nitrogen, phosphorus, calcium, and sulphur in the eroded material from corn or wheat land may equal or exceed the amounts taken off in the crops. Only small amounts of nitrogen were lost as nitrates in the run-off water. Mechanical analyses showed that the material eroded from the bare and the cultivated plats contained a higher percentage of sand and a lower percentage of fine material than the soil lost from the other plats.

The results as a whole are taken to indicate that much can be done in the Corn Belt toward reducing run-off and the disastrous effects of erosion by planning crop rotation in such a way that the land will be covered with a growing crop a very large portion of the time.

The leaching of alkali soil, J. E. GREAVES, C. T. HIRST, and Y. LUND (*Soil Sci., 16 (1923), No. 6, pp. 407–426*).—Studies conducted at the Utah Experiment Station to determine the rapidity with which the various salts leach from different soils, the quantity of plant nutrients removed from the soil during leaching, and the chemical and biological changes which result from the action of the various salts upon the soil and their removal are reported. The soils used were three natural alkali soils, one in which chlorids predominated, a second in which sulphates predominated, and a third which was heavily charged with sodium carbonate. A productive calcareous silt loam was also used, which was made into an alkali soil by various treatments with sodium chlorid, sulphate, and carbonate. These were leached in 2-gal. jars until the greater portions of the salts were removed.

The natural alkali soil behaved similarly to the nonalkali soil treated with a mixture of the salts. Soil treated with sodium carbonate leached very slowly and after leaching was in very bad tilth. Soil treated with sodium chlorid leached more readily than that treated with sodium carbonate, but slowly as compared with the natural soil, and remained in a bad physical condition. Soil treated with sodium sulphate leached rapidly and was left in fair tilth.

Sodium sulphate leached readily from the soil, and the first drainage water was nearly saturated, from 88.8 to 97.7 per cent of the sulphate being removed. The first water passing through the soil treated with sodium chlorid contained from 71.6 to 94.5 per cent of the chlorid. Sodium carbonate leached out very slowly, and from 21.6 to 66.9 per cent of the added carbonate was recovered in the drainage water. It was impossible by the leaching process to free a column of soil, 1 ft. in depth and provided with ideal underdrainage, from sodium carbonate to such an extent that crops would grow upon it.

From 1.2 to 16.4 times as much lime was leached from alkali soil as from normal soil, indicating that the various salts greatly increased the solubility of calcium. This effect was least in the case of sodium carbonate and greatest in the case of sodium chlorid. From 0.4 to 6 times as much magnesium was leached from treated soil as from untreated soil, and the order of solubility was the same as that of lime. The order in which calcium and magnesium leave the soil made it possible for some soils to be left after leaching with a toxic lime-magnesia ratio.

From 3.6 to 23.3 times as much phosphorus was leached from the treated soil as from the untreated soil. This excess was greatest when sodium carbonate was added to the soil and least when sodium sulphate was applied. Most of it is attributed to the direct action of the salt on the insoluble inorganic phosphorus of the soil. However, a study of the carbon-nitrogen-phosphorus content of the drainage waters from soil treated with sodium carbonate indicated that considerable quantities of organic phosphorus were carried out in the drainage waters.

The potassium content of treated soil was from 1.5 to 3.8 times as great as that of the untreated soil. The greatest quantity was found in the leachings from soil treated with sodium chlorid and the least in soil treated with sodium carbonate. The nitrogen content of the treated soil after leaching was from 2.2 to 9.1 times that of the untreated soil and the carbon content from 1 to 4.5 times. This difference in losses is taken to indicate that protein material was rendered soluble.

The results as a whole are taken to indicate that soil amendments often make more plant nutrients soluble, especially phosphorus and nitrogen. It is also considered likely that the long unproductive period following the drainage of alkali soil is caused by (1) the leaching of much of the readily available plant nutrients, (2) the poor state of tilth of the drained soil, and (3) sometimes a toxic lime-magnesia ratio.

Soil survey of Iowa.—Reports 30, 31, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpts. 30 (1923), pp. 70, pls. 2, figs. 13; 31, pp. 64, pl. 1, figs. 11*).—Two county soil surveys are presented which include analyses and greenhouse and field experiments to determine the composition, fertilizer requirements, and crop adaptations of the prevailing soil types and information on methods of conducting soil surveys in Iowa.

No. 30, Fayette County soils.—This is an area of 463,360 acres lying partly in the Iowan drift-soil area and partly in the Mississippi loess area in northeastern Iowa. There are two distinct topographic divisions apparent in the county. Throughout the western and southern parts where the soils are derived from glacial drift the area consists of undulating prairie land. In the northeastern corner, covering about one-fourth of the area, the various drainage channels have cut deeply into the loessial material, and the entire surface is more rolling and the topographic features more pronounced than in the drift area. In general, drainage conditions are said to be fairly satisfactory throughout the county.

The soils are classed as drift, loess, terrace, swamp and bottomland, and residual soils. The drift soils cover 62.3 and the loess soils 27.3 per cent of the area. Including muck, 23 soil types of 14 series are mapped, of which the Carrington loam and Clyde silty clay loam drift soils and the Fayette silt loam loess soil cover 42.1, 15.4, and 20.3 per cent of the area, respectively. Practically all the soils are said to be acid in reaction, and the supply of organic matter and nitrogen is not high. The phosphorus content of the soils is said to be low.

No. 31, Wright County Soils.—This survey deals with the soils of an area of 368,000 acres lying in the Wisconsin drift soil area in north-central Iowa. There are two distinct topographic divisions in the county. The drift plain to the west has a nearly level to gently undulating topography. The morainic area to the east consists of a gently to sharply rolling plain cut by chains of morainic hills. The drainage system of the county is said to be poorly developed.

The soils are classed as drift, terrace, and swamp and bottomland soils, of which the drift soils cover 92.5 per cent of the area. Including muck, peat, and gravel pits, 17 soil types of 9 series are mapped, of which the Webster silty clay loam and Webster, Carrington, and Clarion loams cover 29.5, 25.1, 22.1, and 13.9 per cent of the area, respectively. Some of the soils are said to be acid and many are well supplied with organic matter and nitrogen, but in several cases the soils are not adequately supplied with these constituents. The phosphorus supply in the soils is generally low.

Soil survey of Muhlenberg County, Kentucky, J. A. KERR ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+939-964, fig. 1, map 1*).—This survey, made in cooperation with the Kentucky Experiment Station, deals with the soils of an area of 302,080 acres lying within the Appalachian Plateau region in west-central Kentucky. The topography is prevailingly rolling to hilly. The upland is said to be well drained through numerous streams.

The soils of the county are said to be light in color and consist of a relatively light-textured surface layer, a heavier textured layer below this, and still deeper a layer consisting of the disintegrated and partially oxidized parent rock. Including rough stony land, 17 soil types of 10 series are mapped, of which the Tilsit, Hanceville, and Atkins silt loams and the Hanceville stony loam cover 31.1, 25.7, 13.1, and 10.6 per cent of the area, respectively. Chemical analyses of samples of soil and subsoil representing the different prevailing types of the county are also included.

The sandy soils of the southern peninsula of Michigan, M. M. MCCOOL and J. O. VEATCH (*Michigan Sta. Spec. Bul. 128 (1924), pp. 31, figs. 17*).—Data on the physical and chemical characteristics, fertility requirements, and crop adaptations of the prevailing soil types of the southern peninsula of Michigan are presented. The sandy soils of the peninsula are said to occupy an area of more than 8,000,000 acres and exhibit wide variation in their chemical and physical characteristics, drainage, productiveness, and agricultural value.

The chemical analyses indicate that the percentages of mineral elements are smaller than in the group of heavier soils, and the average quantity of moisture held in the well-drained sands is also lower than that held by loams and clay loams. It is stated that the readily available virgin fertility of the sand soils is largely contained in the organic matter, mainly in the first 3 to 6 in. of soil. This organic matter is dissipated rapidly under cultivation.

Soil survey of Howard County, Nebraska, F. A. HAYES ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+965-1004, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 359,040 acres lying near the eastern margin of the Great Plains region in east-central Nebraska. It is stated that about four-fifths of the area consists of upland and the remainder of terraces and first bottoms. The topography of the upland ranges from rough and hilly to almost flat, while the bottoms and terraces have a generally flat surface. As a whole the county is well drained.

The soils are of loessial, eolian, colluvial, and alluvial origin. Including dunesand and riverwash, 25 soil types of 11 series are mapped, of which the Grundy silt loam, Marshall silt loam (eroded shallow phase), Valentine sand, and Marshall silt loam (shallow phase) cover 21.7, 15.3, 14.2, and 10.3 per cent of the area, respectively.

Soil survey of Tarrant County, Texas, H. W. HAWKER ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. IV+859-905, pls. 4, figs. 2, map 1*).—This survey, made in cooperation with the Texas Experiment Station, deals with the soils of an area of 565,760 acres in northeastern Texas. The topography varies from nearly level to rolling with a small area of rough land adjacent to stream valleys. Good drainage is said to prevail throughout the county.

The soils of the county range in color from dense black to gray and in texture from heavy clay to sand. In general the soils are grouped on the basis of color and texture into an area of from dark to black soils in the Black Prairie belt, of light colored soils in the East Cross Timbers belt, of predominantly dark colored soils in the Fort Worth Prairie, and of light colored soils in the West Cross Timbers area. Including rough stony land, 32 soil types of 24 series are mapped, of which the Denton clay and the Kirvin fine sandy loam cover 34.9 and 14.4 per cent of the area, respectively.

Experiments with bacterial soil fertilizing preparations, I. A. MAKRINOFF (*Soil Sci., 17 (1924), No. 1, pp. 19-28, pl. 1*).—This is a contribution from the Institute of Experimental Medicine, Petrograd, which has been translated from the Russian by J. S. Joffe, of the New Jersey Experiment Stations.

Studies are reported which showed that a properly prepared inoculant applied to the soil will in most cases be beneficial from the standpoint of inoculation if the soil is kept in condition for the proper development of the organisms. The conditions indispensable for the successful application of such preparations are a mellow soil, proper moisture content, and well selected fertilizers. It is concluded that, with the precautions noted, soil inoculations may be practiced on a large scale under field conditions.

Is it possible to make a bacterial soil preparation for nonlegume crops? I. A. MAKRINOFF (*Soil Sci., 17 (1924), No. 1, pp. 31-36, pls. 2*).—In this contribution from the Institute of Experimental Medicine, Petrograd, translated from the Russian by J. S. Joffe, studies are reported which showed that bacterial inoculation and soil cultivation and fertilization must not only correspond strictly to the needs of plants but also to the physiological requirements of the microbe employed.

Oxidation of ammonia and nitrites by microorganisms under different conditions, R. N. GOWDA (*Soil Sci., 17 (1924), No. 1, pp. 57–64, fig. 1*).—Studies conducted at the Iowa State College on the proper conditions of aeration and reaction for vigorous nitrification in soils are reported.

When a current of air was passed through a liquid culture of nitrate-forming organism, 31.4 mg. of sodium nitrate was oxidized per day, and under the same conditions 18 mg. of ammonium sulphate was oxidized by nitrite-forming organisms. When a nutrient solution of ammonium sulphate was allowed to drip into the top of a long tube containing limestone of the size of split peas, on the surface of which a flora of nitrite-forming organisms had been established, and a current of air was drawn through the mass, the rate of oxidation of ammonium sulphate reached the maximum of 318 mg. per day.

Vigorous oxidation of ammonium sulphate by the nitrite-forming organisms took place when the reaction of the liquid medium was around pH 8. The optimum reaction for the nitrate-forming organisms was between pH 8.5 and 8.8. Magnesium carbonate had no injurious toxic effect when used as a base in the oxidation of ammonium sulphate.

Progress in the fertilization of arable soils [trans. title], J. STOKLASA (*Ann. Sci. Agron. Franç. et Étrangère, 40 (1923), No. 4, pp. 203–211*).—Studies are reported the results of which are taken to indicate that the presence of bacterial life in soils is absolutely necessary for the prosperity of crops and that the most important biological phenomenon is the formation of bicarbonates in soil.

Fertilizer needs of North Carolina soils—how to supply them, C. B. WILLIAMS and W. F. PATE (*N. C. Agr. Col. Ext. Circ. 141 (1924), pp. 15*).—Practical information on the fertilizer requirements of the prevailing soil types of North Carolina and of methods of meeting them by means of proper fertilization is presented. A list of fertilizer manufacturers in the State is included, together with data on sources and prices of various types of lime on the market.

Manuring of grassland for hay, W. E. BRENCHLEY (*London and New York: Longmans, Green & Co., 1924, pp. VIII+146, figs. 22*).—This is one of the Rothamsted Monographs on Agricultural Science, edited by E. J. Russell. It presents in considerable detail the results of large-scale experiments on the manuring of pasture and grasslands. The results as presented deal solely with the Rothamsted plats on heavy soil, and the real intention of the monograph is to attempt to round off and complete the work begun by Lawes and Gilbert in order to suggest possible lines along which future developments of experimental work on meadowland may profitably extend.

A summary of the general effects of individual and combined manures on the yield and growth of crops on unlimed plats showed that all the manures tested gave an increase of crop over no manure in most years, the degree of improvement varying greatly with the different combinations. When nitrogenous manures were applied alone sodium nitrate gave an appreciable increase in yield, but ammonium sulphate gave a decreased yield in some seasons. The growth of herbage was not altogether satisfactory in either case. When mineral manures were used alone the increase with a complete fertilizer was very considerable, the crop being on an average from two to three times that from the unmanured plats. In the absence of potash the crop was only two-thirds of that with a complete fertilizer.

When nitrogenous and mineral manures were combined very heavy yields were obtained with both sodium nitrate and ammonium sulphate, the former increasing the yield more rapidly than the latter. The growth of the herbage was very rank and tended sometimes to become coarse and hard, especially with heavy applications of ammonium sulphate.

When organic manures were used the yield was increased, and the grass started earlier in the spring than when artificial fertilizers were used alone.

In the absence of manure from 30 to 40 species of grass were present, subject to considerable seasonal fluctuations. As the applications of manure, especially of a nitrogenous character, became successively heavier the number of species decreased until, with large applications of ammonium sulphate only about 8 or 10 species survived, and of these only 2 or 3 were significant in quantity. Mineral manures were much less effective than nitrogenous fertilizers in reducing the number of species.

An almost complete elimination of Leguminosae was effected by ammonium salts either with or without mineral manures. This reduction, while considerable, was less drastic with sodium nitrate. Miscellaneous species were prevalent in the latter case and less so with ammonium salts, but the addition of mineral manures and an increase in nitrogen applications caused a steady reduction until, where heavy manuring was carried out, the herbage consisted of little but grasses. Mineral manures afforded strong encouragement to leguminous plants, although in the absence of potash the increase was usually less strongly marked. In the presence of nitrogenous manures, especially ammonium salts, the encouraging action of the mineral manure was entirely masked by the inhibiting action of the nitrogenous manure. Barnyard manure probably encouraged leguminous plants to some extent when used alone, but when used in combination with artificial fertilizers the nature of the latter was the determining factor. The same applied to miscellaneous plants.

Liming increased the yield and growth of crops in all cases when used with ammonium salts and mineral fertilizers, and also with complete mineral fertilizers alone. However, where incomplete mineral manures or sodium nitrate were used crops were reduced considerably. A similar reduction occurred with frequent applications of barnyard manure and fish guano, but in the absence of manure and with ammonium salts alone lime had no constant effect, although in the earlier years an improvement was noted. Liming had no constant effect upon the number and species in most cases, although an increase was observed with ammonium salts alone and with heavy applications of ammonium salts and mineral fertilizers.

Graminaceae were usually more or less increased by liming except when used with ammonium salts, where a decrease occurred which was very considerable in some seasons. With superphosphate and with complete minerals a relatively heavy increase of Leguminosae occurred, while with minerals without potash and sodium nitrate plus minerals a corresponding decrease was evident. Miscellaneous plants were decreased by all manures except sodium salts alone, in which case an increase occurred.

Sodium silicate applied in conjunction with heavy ammonium salts and mineral fertilizer applications had a very similar and often greater effect than that of lime. The beneficial action of sodium silicate is probably due to its alkalinity.

Chemical fertilizers, M. Soave (*I Concimi Chimici nelle loro Proprietá e nel loro Impiego. Piacenza: Fed. Consorzi Agrari, 1922 pp. 61, figs. 4*).—A rather detailed discussion of the nature, use, and availability of the different phosphatic, potassic, nitrogenous, and radioactive fertilizers is given from the Italian viewpoint.

Fertilizer primer [trans. title], M. Hoffmann (*Flugschr. Deut. Landw. Gesell., No. 7, 22. ed. (1922), pp. 208, figs. 3*).—This is the twenty-second edition of this primer, giving practical information on natural and commercial fertilizers and fertilizing practices.

Pulverizing fertilizer ingredients, L. H. STURTEVANT (*Chem. and Metall. Engin., 30 (1924), No. 5, pp. 193–195, figs. 4*).—A practical discussion is given of the grinding problems which are encountered by all types of plants in the fertilizer industry.

Peat in 1921, K. W. COTTRELL (*U. S. Geol. Survey, Min. Resources U. S., 1921, pt. 2, pp. 13, 14*).—This report states that the quantity of peat produced in the United States in 1921 decreased 58 per cent and the value decreased 72 per cent. Peat used in the manufacture of fertilizer decreased 53 per cent in quantity and 68 per cent in value as compared with the previous year.

The most favorable form of nitrogen for major crops [trans. title], G. TRUFFAUT and N. BEZSSONOFF (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 8, pp. 723–725*).—Four years' studies on the influence of different forms of nitrogen on different major crops on slightly acid and slightly alkaline soils are reported.

It was found that mixtures containing urea nitrogen were superior to salts of ammonia, nitrates, cyanamid, and urea used alone. In one series of experiments on mustard, barley, beets, and potatoes, using ammonium sulphate and urea, the best results were obtained when only 5 per cent of the nitrogen used was supplied by the urea. This superiority was as manifest in acid soil as in alkaline soil. In the former the best results were obtained with a mixture of urea and sodium nitrate, and in the latter with a mixture of urea and ammonium sulphate. These two types of mixtures permitted a reduction in the total nitrogen fertilization of from 2 to 3 per cent and caused a general increase in the weight of the crop.

Catalyzers for the oxidation of ammonia, W. W. SCOTT (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 74–82, figs. 3*).—A list of 52 substances, elements, or compounds used by the author for catalytic oxidation of ammonia to nitric acid is given in the order of their efficiency. The influence of certain substances added as accelerators is indicated, and several additional examples are given of substances used, showing a markedly increased efficiency due to their presence.

Cobalt has proved to be one of the most efficient elements, and in combination with small amounts of added substances rivals platinum in efficiency as a catalytic agent for the exidation of ammonia. The effects of beryllium, cerium, bismuth, thorium, and nickel, ascertained in recent experiments, are shown and a comparative table given. Bismuth appeared to be the most efficient accelerator for cobalt. However, the amount should be kept within certain limits, as large amounts of bismuth will form an easily fusible alloy and amounts less than 0.1 per cent are not efficient. A good combination is 97 parts by weight of cobalt oxid and 3 parts by weight of bismuth oxid, although this may be varied within fairly broad limits. Several substances apparently improve with use and are not so easily poisoned as platinum.

Possible agricultural utilization of U. S. Nitrate Plant No. 2, Muscle Shoals, Ala. (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 64, 65, fig. 1*).—A chart is given representing a distribution that could be achieved in a few years rather than a distribution possible on the basis of the present fertilizer market. It indicates a possible step in a progressive scheme. It is believed that ammonium phosphate should gradually and progressively displace ammonium sulphate as a product of the plant.

Availability studies upon high-potash nitrate, R. V. ALLISON (*Jour. Amer. Soc. Agron., 16 (1924), No. 1, pp. 26–30*).—Greenhouse and field studies conducted at the New Jersey Experiment Stations on the availability of the nitrogen and potash of high-potash nitrate are reported.

The results of the pot culture studies indicated that the value of the nitrogen and potash of this compound is fully equivalent to that derived from sodium nitrate and potassium sulphate. Because of the fact that the field plats responded strongly to applications of nitrogen and not at all to potash, it is assumed that the nitrogen of the high-potash nitrate was as effective as that of sodium nitrate.

The liberation of potassium from feldspars and of potassium and carbon dioxid from soils by fertilizer and acid treatments, S. C. Vandecaveye (*Soil Sci., 16 (1923), No. 6, pp. 389–406, figs. 3*).—Studies in solutions and soils conducted at the Iowa Experiment Station to ascertain the relative effect of carbon dioxid, bacterial activities, mineral and organic acids, and decaying organic matter on the liberation of potassium from the insoluble supply in the soil are reported.

A manure extract and a combination of manure extract and acids in moderate concentrations gave a decided increase in water-soluble potassium from finely ground orthoclase and alunite in water solutions. Sterilization and the addition of acids, calcium carbonate, and calcium sulphate did not increase the water-soluble potassium of the same minerals. The application of relatively small amounts of calcium sulphate to Carrington loam caused an increase in water-soluble potassium, while calcium carbonate and acid phosphate did not. The action of contaminating forms of organisms, consisting largely of molds, resulted in a decided increase in carbon dioxid and a smaller increase in water-soluble potassium in sterilized soil.

Organic matter such as manure and clover hay and a combination of acids and organic matter applied to sterile and nonsterile soils resulted in an increase of water-soluble potassium. This increase, due to the absorptive power of the soil colloids, was less than the amount of soluble potassium applied in the form of manure and clover hay.

The production of carbon dioxid did not prove to be an index of the quantity of water-soluble potassium liberated. The maximum carbon dioxid production was secured with applications equivalent to 16 tons of manure per acre. The carbon dioxid produced in sterile soils was approximately 50 per cent of that obtained in the nonsterile duplicate. Sterilization resulted in a decided increase in the concentration of the soil solution and in the amount of water-soluble soil potassium. It also resulted in a slight increase in the H-ion concentration of the soil. The reaction of the soil showed no relation to the carbon dioxid production or to the liberation of potassium, but there seemed to be some indication that a H-ion concentration less than pH 6 decreased the potassium-absorbing power of soil colloids.

Extracting potash from Russian soil, J. R. Minevitch and W. M. Malisoff (*Chem. and Metall. Engin., 30 (1924), No. 13, pp. 501–504, figs. 2*).—The history, development, economics, and engineering of the Russian potash industry are briefly summarized. This industry has its origin in antiquity and is based on the extraction of potash from the ashes of weeds, plants, and wood. Sunflowers have been found to be particularly adapted for the production of potash in this manner. While recent investigations have shown that Russia has abundant natural deposits of potassium-bearing minerals, attention seems to have been centered largely on the growing of sunflowers and the burning of the stalks thereof for the recovery of the potassium content. The final ash contains the carbonates, sulphates, phosphates, chlorids, and silicates of sodium, potassium, magnesium, and iron. The potassium carbonate content varies according to the ash from 25 to 50 per cent.

The fertility of the various potash-producing regions has been classified in accordance with the amounts of potash which may be secured from a pound of sunflower ashes. The Maikop territory along the Kooban River seems to be the most productive territory, followed closely by the upper Maikop and part of the Labinsk territories. Analyses of typical ashes from sunflower stalks showed a potassium oxid content of more than 36 per cent.

The war seriously interfered with the potash industry in Russia, and it is stated that the maximum production of the present plants is approximately 60 per cent of their pre-war capacity. There are now 8 plants fully equipped for production, 6 need substantial improvements, and 10 are wholly unfit for production.

Kooban potash is known in foreign countries as Caucasian potash, and on account of its high quality was able to compete with the German-made product before the war. Aside from its cheaper cost, Caucasian potash is practically free from sodium. The largest quantities of Russian potash have been imported by Great Britain. Germany, although a producer and a competitor with Russia, also imported large quantities of Russian potash.

Relative availability of the phosphorus of raw rock and acid phosphate in soils, M. I. Wolkoff (*Soil Sci., 17 (1924), No. 1, pp. 39–56, figs. 5*).—Comparative studies conducted at the University of Illinois on raw rock and acid phosphates with reference to their behavior after application to various types of soil and to the factors influencing their behavior are reported.

The results showed that after phosphorus in the form of phosphatic fertilizers is applied to ordinary mineral soils it becomes considerably less soluble in N/5 nitric acid. Peat soil was found to be an exception in that it does not depress the recovery of phosphorus under the same conditions. The recovery of phosphorus from soil treated with double acid phosphate was no greater than that from the same soil treated with ground rock phosphate, using N/5 nitric acid for the solvent.

After the first extraction with N/5 nitric acid the subsequent extractions with fresh acid failed to extract a considerable amount of additional phosphorus, and five consecutive extractions failed to recover the entire amount of phosphorus applied either in the form of rock phosphate or of double acid phosphate.

The reaction between the phosphorus of phosphatic fertilizers and the substances present in the soil proceeded very rapidly and was practically completed the first day. The moisture content of soil treated with phosphatic fertilizer was not a factor in modifying the phosphorus recovery by N/5 nitric acid extraction. It is thought that high temperature, while having no influence on rock phosphate, may decrease the availability of phosphorus in soil treated with acid phosphate. Phosphorus recovery was practically the same at temperatures of 0 and 20° C.

Of the various supplementary substances used, calcium oxid, calcium carbonate, potassium chlorid, and sodium nitrate did not materially affect the phosphorus recovery from soils treated with rock or acid phosphates. This is in direct contrast with the action of ammonium sulphate and calcium sulphate, which increased the phosphorus recovery very rapidly. It is thought that the latter case may explain in part the beneficial effect of the application of gypsum to some agricultural soils. Calcium carbonate in large amounts inhibited phosphorus recovery, the effect being very much in proportion to the amount of limestone present in the soil.

Raw phosphate v. acid phosphate, C. E. Thorne (*Ohio Sta. Mo. Bul., 9 (1924), No. 1–2, pp. 12–15*).—The results of several comparative tests of raw rock phosphate and acid phosphate are briefly summarized, indicating that while raw phosphate was generally used with profit, in practically every case the net gain from acid phosphate was much greater than from raw phosphate.

Comparative assimilabilities of tricalcium phosphate and phosphates of aluminum and iron [trans. title], C. Brioux (*Ann. Sci. Agron. Franç et Étrangère, 40 (1923), No. 4, pp. 185–202*).—A review of the work of others bearing on the subject is presented, and studies of the influence of the three phosphates on six different crops are reported.

The results showed that the aluminum phosphate was slightly superior to the tricalcium phosphate for the production of dry matter and much superior with reference to phosphoric acid assimilation by crops. The iron phosphate was inferior to the other two phosphates in availability. However, it was utilized to a certain degree by some crops, notably barley and buckwheat.

Studies of the solubility of the phosphoric acid of superphosphate, phosphatic slag, and phosphatic chalk, when added in equivalent amounts of phosphoric acid, to acid and slightly alkaline silt soils and to a markedly calcareous soil, as indicated by seven different solvents after a year's time, are also reported.

The results showed that the soluble phosphoric acid of superphosphate reverts to tricalcium phosphate in calcareous soils and to iron or aluminum phosphates in soils containing little or no lime. The phosphoric acid of natural phosphates in more or less acid soils was found to acquire a greater solubility in such solvents as ammonium citrate and in citric and acetic acids. The solubility of phosphatic slag in ammonium citrate was markedly increased in all three soils. The different solvents acted quite differently, and as a general rule the acid solvents did not affect the phosphoric acid combined with the soil organic matter.

Manufacture of phosphoric acid by the volatilization process, W. H. Waggaman (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 176–179, fig. 8*).—In a contribution from the U. S. D. A. Bureau of Soils some of the technical problems involved in the production of phosphoric acid by the volatilization method are discussed. The fuel furnace has been shown to cause volatilization as effectively as the electric furnace, although radiation and heat losses are considerably less in the latter. It is considered possible to markedly reduce such losses.

The question of what temperature is best adapted for volatilization, especially in the fuel furnace, is still only partially answered, since it is dependent upon such other factors as the lime-silica ratio in the charge, the fineness of division and intimate contact of the reacting materials, the amount of reducing agent present, the time factor, and the type of furnace used.

Another problem of commercial importance studied by the bureau was the determination of the proper phosphoric-acid content of the residual slag for the most economic operation.

The future of the pyrolytic process for phosphoric acid, W. H. Waggaman and H. W. Easterwood (*Chem. and Metall. Engin., 30 (1924), No. 11, pp. 432–435, figs. 5*).—In a contribution from the U. S. D. A. Bureau of Soils, a description and discussion are presented of the pyrolytic method of producing phosphoric acid. It is concluded that this process holds greater promise of commercial success than any of the other processes and appears to offer a solution of the pressing problems in conservation, transporation, and the economic handling of phosphatic materials.

It is pointed out that the most important factor in the volatilization of phosphoric acid is the maintenance of reducing conditions. While the electric furnace offers perhaps the most convenient means of maintaining a reducing atmosphere, it has been found that such conditions may also be readily obtained in certain standard types of fuel-fired furnaces. The work which has been conducted by the bureau in heating mixtures of phosphate rock, sand, and coke to a smelting temperature is stated to have proved beyond question that the phosphoric acid can be eliminated from such mixtures by means of fuel, provided reducing conditions are maintained. The success of the fuel process appears to be largely a question of designing a furnace wherein such conditions can be obtained without undue loss of the thermal value of the fuel. One of the most important developments in this connection has been the successful briquetting of run-of-mine and low-grade phosphates.

Liming Wisconsin soils, A. R. WHITSON, G. RICHARDS, and H. W. ULLSPERGER (*Wisconsin Sta. Bul. 361* (*1924*), *pp. 24, fig. 12*).—Practical information on the liming of the prevailing soil types of Wisconsin is presented.

Results of lime application to the soil in the Silay District, H. A. LEE ET AL. (*Sugar Cent. and Planters News, 5* (*1924*), *No. 2, pp. 77–79, fig. 1*).—Data are briefly reported demonstrating the beneficial influence of burnt slaked lime on cane soils of the Silay District in the Philippines.

The liming of land, J. A. VOELCKER (*Jour. Farmers' Club* [*London*], *1924, pt. 2, pp. 19–38*).—Practical information is given on the different forms of agricultural lime and their manufacture and on their practical use in the treatment of soils, with particular reference to the requirements of British agriculture. It is stated that the matter of the lime requirement of soils has not yet been definitely settled, and that the information yielded by the methods discussed is of relative value only. Tabular data on liming experiments and analyses of different kinds of lime are appended.

Effect of gypsum on the cropping of Pusa soils, W. H. HARRISON (*Agr. Research Inst., Pusa, Sci. Rpts. 1922–23, p. 29*).—Pot culture experiments during two cropping seasons to test the effect of gypsum when applied alone or in combination with green manures or monocalcic phosphate showed that gypsum exerted no beneficial effect, but in the majority of cases appeared to depress the yield decidedly.

Field experiments on plats of known cropping value resulted in a decrease of 23 per cent over a period of three years, while the surrounding comparison plats showed an average increase of 16 per cent, thus clearly defining the depressing effect of gypsum. It is considered probable that this action of gypsum accounts in some measure for the uncertain reaction of superphosphate when applied to the Pusa fields.

Experiments with Sulgine and Biogine [trans. title], H. VON FEILITZEN and C. BARTHEL (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 254* (*1924*), *pp. 16*).—Pot culture and field experiments conducted at the Central Swedish Agricultural Experiment Station with Sulgine and Biogine, catalytic and partially sterilizing fertilizers, are reported.

Sulgine, which contains about 30 per cent of calcium sulphid, was compared with the same amount of calcium sulphid alone applied both without manure and with complete manure to crops on sand and clay soils. There was no increase in the growth of barley in either case with the amounts of Sulgine used. In experiments on heavy clay soil, both Sulgine and Biogine failed to show any effect on the development and yield of the potato crop. Neither Sulgine nor calcium sulphid had any effect in nitrification experiments in sandy and clay soils with and without ammonium sulphate.

A study of the rate of decomposition of cellulose in the same soils with Sulgine and calcium sulphid gave entirely negative results. Sulgine had no effect as a soil disinfectant against finger-and-toe disease on swedes. The results are taken to indicate that Sulgine and Biogine when used in the amounts recommended do not have any effect as disinfectants or fertilizers on these soils.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures, 1923, C. S. Cathcart (*New Jersey Stas. Bul. 393 [1923], pp. 5–37*).—Guaranties and actual analyses of 670 samples of fertilizers and fertilizer materials and home fertilizer mixtures collected for inspection during the spring of 1923 in New Jersey are presented.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1923, C. S. Cathcart (*New Jersey Stas. Bul. 395 (1923), pp. 5–38*).—Guaranties and actual analyses of 259 samples of fertilizer and fertilizer materials and of 16 samples of agricultural lime collected for inspection in New Jersey during the fall of 1923 are presented, together with a summary of the fertilizer inspection in the State for the entire year and a list of brands of fertilizer and fertilizer materials registered for sale in the State during the fiscal year ended October 31, 1923.

Fertilizer registrations for 1924, C. S. Cathcart (*New Jersey Stas. Bul. 396 (1924), pp. 5–27*).—A list of brands of fertilizers registered for sale in New Jersey for the fiscal year ending October 31, 1924, is presented.

Report of analyses of commercial fertilizers sold in New York State, January 1 to July 1, 1922, (*N. Y. State Dept. Farms and Markets, Agr. Bul. 151 (1923), pp. 70*).—Guaranties and the results of actual analyses of 807 samples of fertilizers and fertilizer materials collected for inspection in New York from January 1 to July 1, 1922, are presented.

Analyses of fertilizers, season 1922–1923, W. G. Haywood, E. S. Dewar, Z. B. Bradford, C. L. Williams, and R. L. Mills (*N. C. Dept. Agr. Bul., 1923, Dec., pp. 3–72*).—This part of this report contains guaranties, actual analyses, and relative valuations of 1,706 samples of fertilizers and fertilizer materials collected for inspection in North Carolina during the fall months of 1922 and spring months of 1923.

[Commercial fertilizers, agricultural lime, and limestone], S. Mawer (*Ohio Dept. Agr., Div. Feeds and Fert. Off. Rpt. 1922, pp. 161–213, 307–334*).—These sections of this report contain the results of actual analyses and guaranties of 851 samples of fertilizers and fertilizer materials and agricultural lime and limestone collected for inspection in Ohio during the spring and fall of 1922.

Fertilizer report [Pa.], J. W. Kellogg (*Penn. Dept. Agr. Bul. 378 (1923), pp. 67*).—Guaranties, actual analyses, and valuations of 756 samples of fertilizers and fertilizer materials representing 485 brands collected for inspection during the period from January 1 to July 31, 1923, are presented and discussed.

The results of the chemical analyses showed that 20.1 per cent of the total number of samples were deficient in one or more forms of plant nutrient material and failed to meet claimed guaranties to the extent of 0.2 per cent or more below them.

AGRICULTURAL BOTANY.

Life movements in plants, J. C. Bose (*Bose Research Inst., Calcutta, Trans., 3–4 (1920–1921), pp. XX+599–902, figs. 107*).—The present two volumes, bound together and continuing those previously noted (E. S. R., 46, p. 528), "will be found to contain accounts of investigations on geotropism, on diaheliotropic attitude of leaves as regulated by transmitted nervous impulse, on assimilatory and dissimilatory changes under light, on new methods of recording the effects of protoplasmic changes under stimulus; and also of various methods and appliances for detection of the two fundamental reactions to which all plant movements are due.

"In regard to geotropism of higher plants, electric investigations have been described which lend strong support to the theory of statoliths, indeed practically confirm it. Investigation by means of the electric probe has made it possible to explore the interior of the plant and map out the excitatory changes from layer to layer under the stimulus of gravity. The results of these investigations show that while the layers of tissue contiguous to the upper perceptive layer undergo a contraction, those contiguous to the lower perceptive layer exhibit an expansion. The cause of this difference has also been discovered in the fact that the geotropic stimulus due to the pressure of heavy particles acts directly on the upper, and indirectly on the lower, layer of the responding cells. Another discovery, namely, the critical angle for immediate geotropic excitation, also lends fresh and independent support to the theory of statoliths.

"An explanation of the diageotropism of dorsiventral organs has been found in the differential excitability of the two sides of the organ. In regard to the diaheliotropic attitude of many leaves, it is shown to be due to transmitted impulse of a nervous character initiated in the lamina and conducted to the motile organ. The nervous tissue which conducts excitation has been localized in the phloem of the fibrovascular bundle. As regards the pulvinus of Mimosa, it is found to be a highly complex organ, each of its four quadrants responding in a definite way by a down or up movement, or by a right- or left-handed torsion.

"The method of resistivity variation has been further perfected, and the responses of the vegetable tissue to various modes of stimulation—mechanical, electric, and photic—have been recorded. The characteristic responses have been shown to correspond to the mechanical and electromotive responses. The new quadrant method has been rendered extremely sensitive, enabling us to record the response to light emitted by a single spark.

"The response of the plant is modified by the changing intensity of light during the course of the day, but no sensitive appliances had hitherto been available for the continuous record of the variation of light. This difficulty has been overcome by the invention of the automatic radiograph.

"The movement of plants is affected by the ascent of sap, which causes an increase of turgor in the tissue. Prolonged investigations on the 'physiology of the ascent of sap' have shown that the propulsion of sap is brought about by the pulsating and pumping action of the cells of the inner layer of the cortex; it is also shown that the state of turgor of the plant at any hour of the day is determined by the gain or loss of liquid by the plant, the relative variations of which are definitely traceable to external agencies.

"In the general review [of volumes 1 to 4] it has been shown that the innumerable variations in response are produced by the different combinations of numerous factors, some concordant and others antagonistic. This is the secret of the great complexity of the plant movements, which are by no means capricious. By the isolation of individual factors and separate investigations on them it is possible to unravel the complexity and discover a generalization for the life movements in plants."

The fifth volume of this series has been noted (E. S. R., 49, p. 820).

Injury, recovery, and death, in relation to conductivity and permeability, W. J. V. OSTERHOUT (*Philadelphia and London: J. B. Lippincott Co., 1922, pp. 259, figs. 96; rev. in Bot. Gaz., 75 (1923), No. 2, pp. 215, 216*).—This is one of the series of monographs on experimental biology edited by J. Loeb, T. H. Morgan, and the author.

"This volume endeavors to treat certain aspects of biology according to the spirit and methods of the exact sciences. The treatment is confined to certain fundamental problems which have been studied quantitatively. These studies lead to a theory of some aspects of injury, recovery, and death, as well as of antagonism and permeability. The behavior of the organism in these respects may be predicted with a satisfactory degree of accuracy by means of the equations which express the theory in mathematical form."

Root development of wheat seedlings, W. F. GERICKE (*Bot. Gaz., 72 (1921), No. 6, pp. 404–406, fig. 1*).—Wheat seedlings with shoots from 8 to 10 cm. high and roots from 10 to 12 cm. long were set out in 2-qt. Mason jars filled with tap water, and the cultures were allowed to grow for 6 weeks at a temperature range of from 22 to 32° C. and without renewal of the tap water. At the end of this period the shoots had gained from 2 to 4 cm. and the roots from 60 to 68 cm. or more, the dry weight of the roots then about equaling that of the rest of the plants. Tests of the medium led to the conclusion that stimulation of long-root development of wheat seedlings in tap water was related to nitrogen deficiency in that medium. It was not settled as to whether plant roots can grow without nitrogen, nor was it decided as to what constitutes the best root development in the normal growth of a wheat plant.

Is there normally a cross transfer of foods, water, and mineral nutrients in woody plants? E. C. AUCHTER (*Maryland Sta. Bul. 257 (1923), pp. 33–60*).—The author describes experiments conducted to see if the foods, water, and mineral nutrients which are produced or absorbed on one side of woody plants are used only on that side or if there is an appreciable cross transfer in the plant of such material. Peach, apple, and oak trees and privet bushes were used in this experiment, and the evidence presented, together with other observations, is believed to show conclusively that the mineral nutrients absorbed by the roots on one side of a plant are in a large measure translocated to and used by the trunk, limbs, and leaves directly above them, and there is very little cross transfer within the plant. It is also believed the evidence suggests that the foods manufactured on one side of a plant are used and stored mainly in that side or are translocated to the roots directly beneath.

The evidence relating to the cross transfer of water is not considered conclusive, but it is suggested that water may move through or around the plant without much difficulty. If this should be found to be true, it would indicate that mineral nutrients move independently of water movement in plants. The author suggests that it might be possible by cultivating, pruning, and applying nitrogen to halves of certain biennial bearing trees for two or three years to change their bearing habits so that in the future one-half of each tree would bear one year and the other half the next.

Influence of certain sugars on higher plants, J. M. BRANNON (*Bot. Gaz., 75 (1923), No. 4, pp. 370–389, figs. 3*).—From the fact that sugars differing in chemical properties are found in plants, and from a review of the literature, it would appear that these sugars function variously. This matter has been investigated by the author with regard to glucose and fructose, the plants used being *Pisum sativum*, *Medicago sativa*, *Raphanus sativus*, *Phleum pratense*, and *Bryophyllum* sp., and the results being presented in tabular form with discussion.

Except in case of timothy the data here presented do not support the theory that fructose is superior to glucose for tissue formation. Under the conditions of these experiments fructose is slightly and usually temporarily toxic to the roots of peas, alfalfa, and Bryophyllum. When the two sugars are in the same solution there is no injurious effect to the peas, which, like alfalfa, radish, and timothy, can greatly increase dry weights when grown in the dark on nutrient solutions containing these sugars, an increase of nearly 1,000 per cent over the seed weight appearing in one or two instances.

Hypothesis of formative stuffs as applied to Bryophyllum calycinum, E. Reed (*Bot. Gaz., 75 (1923), No. 2, pp. 113–142, figs. 10*).—Having chosen *B. calycinum* as suitable for study in relation to conclusions offered principally by Loeb (E. S. R., 40, p. 224), the author states that the growth of foliar shoots therein takes place only from the preformed buds in the leaf notches when the plants are growing under abnormal conditions. Supposedly this dormancy is not due to the lack of formative stuffs or specific substances. An inhibiting influence over these meristematic units is not exerted by the plant or any organ thereof. The dormancy or the germination of these units is an expression of the metabolic condition of the organ of which they are a part or of physical or chemical changes. Any factor or group of factors working together may be indirectly responsible for the growth of the foliar plantlets. One of the conditions favoring such growth is very moist air or water. Another is the absence of light.

A preliminary account of symbiotic nitrogen fixation in nonleguminous plants with special reference to Chomelia asiatica, K. Adinarayan Rao (*Agr. Jour. India, 18 (1923), No. 2, pp. 132–143, figs. 2*).—India is thought to abound in plants able to fix atmospheric nitrogen. This preliminary paper contains an account of study attempted at Coimbatore in connection with *C. asiatica* and *Pavetta indica* in respect to bacterial nodules which are described as borne on leaves of these species, the second of which, previously discussed in such connection by Von Faber (E. S. R., 32, p. 327), is here used mainly for comparison.

In *P. indica* the bacteria appear early among the leaf primordia, even in the unopened buds, the stomata affording entrance to the tissues. Rapid cell division and the formation of a special bacterial tissue become evident, as is also the early presence of starch (grains) in the cells, this serving probably as nutriment for the bacteria, which may be later digested by the plants. *C. asiatica* shows a slightly smaller capability to fix nitrogen in the leaf nodules. Even in the seeds the bacteria appear at the growing points of the embryos, thus supposedly establishing the hereditary nature of the symbiosis in the case of *C. asiatica* as announced for *P. indica* by Von Faber. It becomes evident that bacteria are always present in the seeds.

Pot experiments were begun to ascertain whether *C. asiatica* can thrive normally when raised from seeds treated at 55° C. for 30 minutes to kill the supposedly symbiotic bacteria.

The bacteria enter through the stomata (which then close them in) and abstract nitrogen from the air in the leaf, building up therewith their bodies and thereby proving the presence of nitrogen in large quantity in such tissues, which are, therefore, supposed to be of value for increasing soil fertility.

These bacteria are said to be found at all the life stages of the plant, the symbiosis being developed to a much greater extent than in the Leguminosae and being hereditary in character. The typical bacteria are first rod shaped, later showing some forked and curved forms. They are strongly aerobic.

Seasonal variation of sulphur content in certain tissues of the apple tree, R. S. Marsh (*Bot. Gaz., 75 (1923), No. 4, pp. 400–413, figs. 9*).—This study was undertaken to determine the amount of sulphur in different tissues of the apple tree at various seasons of the year, the experiment supplementing the chemical data on the apple spur as published by Hooker in Missouri Station Research Bulletin 40 (E. S. R., 45, p. 123). Samples for analysis were collected from mature Wealthy and Payne Late Keeper apple trees standing in adjacent rows.

The sulphur content, as determined by the sodium peroxid method and presented in tabular and graphical form with discussion, is shown to be of the same order as the phosphorus content in the apple-tree tissues investigated.

"The highest percentages of sulphur are found in the leaves, and then in descending order in spurs, young bark, and old bark. The sulphur content varies inversely with the phosphorus content throughout the year. Sulphur resembles calcium in that it is not mobilized to any great extent. The seasonal variation of sulphur is parallel with the H-ion concentration. The percentage of sulphur is at a minimum in the apple spur at the time of fruit-bud differentiation.

Studies in parasitism.—A contribution to the physiology of the Loranthaceae of New South Wales, J. McLuckie (*Bot. Gaz.*, *75* (*1923*), *No. 4*, *pp. 333–369*, *pls. 3*, *figs. 6*).—This is largely a study of the genus Loranthus, in particular *L. celastroides*, on its hosts in New South Wales where it is common, particularly in the coastal strip, humid conditions being necessary for dissemination and germination of the seed.

The seed is not ejected with explosive force as in Arceuthobium, but is forced out through an operculum by the swelling of the gelatinous cells at its base. Rupture may occur due to striking some object. The fruit is comparatively succulent and may be distributed partly by birds. Doubtless great loss of seeds occurs. Dissemination usually occurs during dull, humid weather. Wind is instrumental in depositing some seeds upon branches of a host. For germination the essential factors are adequate food supply (endosperm), light, moisture, and favorable temperature. The gelatinous seed coat absorbs water, this being the only water source for the seedling until its haustorium reaches the xylem tissues of the host. The root is short and not sensitive to gravitational stimulation, though it is sensitive to contact, the apex becoming a club or disk shaped haustorium when in contact with the host. From the center of this disk the haustorium proper develops, passing into the host. The root is negatively phototropic. The haustorial disk becomes securely attached by the partial solution of the epidermal cells of both disk and host.

During the period of penetration the embryo is nourished chiefly by the food stored in the endosperm and mobilized by the enzyms of the cotyledons. Probably the disintegrating host cells also provide food. The haustorium becomes applied directly to the xylem. Reticulate tracheids differentiate in its axial zone and in contact with the host vessels. There are no sieve tubes in the haustorium, the tissues of which are represented by the tracheids, procambial cells, cortex, and epidermis.

Penetration by the haustorium probably results from pressure and chemical solution, as crushed cells and discoloration mark its advance.

At the point of infection a swelling arises from which secondary roots and branches bearing leaves are developed. The secondary roots develop a new series of haustoria farther along the branch. In many cases the branches of the host are killed by the parasite, owing to the tapping of most of the vascular bundles. Morphologically the haustorium is an especially developed part of the primary root of the seedling.

In some cases, as in *Ficus* sp., the host endeavors to exclude the haustorium by a very pronounced phellogen activity. Lateral expansions of the haustorium may occur in the cortex, and it frequently spreads along the cambial zone. In Banksia stems masses of haustorial tissue occur deeply embedded in the xylem.

L. celastroides has thick, fleshy leaves and sunken stomata. Its xerophily is probably the result of a semiparasitic life. The parasite vegetates under xerophytic conditions, but dissemination and germination are possible only under hydrophytic conditions.

[Root fungi], J. COSTANTIN (*Rev. Sci. [Paris], 61 (1923), No. 23, pp. 733–737, figs. 8*).—This is a brief discussion of the problems of mycorrhiza living in relation to roots of trees, more particularly conifers.

Simple weighing device for large scale transpiration experiments, C. D. LARUE (*Bot. Gaz., 75 (1923), No. 2, pp. 209, 210, figs. 2*).—For use with large plants in transpiration experiments, a method of lifting the cans from beneath is described. This method is said to employ an apparatus which is inexpensive, portable, durable, and always easily obtainable on the market.

GENETICS.

Heredity and eugenics, R. R. GATES (*London and Bombay: Constable & Co. Ltd., 1923, pp. XIII+288, figs. 35*).—Heredity, especially as related to humans, is discussed in six chapters, (1) introduction—definition of heredity; (2) the general aspects of heredity—inheritance of differences, Mendelism, inheritance of resemblances, and development; (3) inheritance of physical characters in man—stature, eye color, skin color and hair characters, albinism, left-handedness, digital abnormalities, and various abnormalities; (4) inheritance of mental characters in man—feeblemindedness, insanity, cacogenic families, musical ability, and handwriting; (5) the limits of heredity—twins, finger prints, inheritance of twinning, and lethal factors; (6) social and world aspects of eugenics—the basis of racial and temperamental differences, the results of crossing between races, the problems of population, and population and quality. An extensive bibliography of 20 pages is given, to which many references are made in the text.

A popular presentation of the principles of heredity, J. MEISENHEIMER (*Die Vererbungslehre in Gemeinverständlicher Darstellung ihres Inhalts. Jena, Germany: Gustav Fischer, 1923, pp. [4]+137, figs. 49*).—The principles of heredity are briefly presented, Mendelism and the mechanism of inheritance, sex determination, and the inheritance of acquired characters being especially considered.

A peculiar eye-color among Malamute-dogs, J. P. LOTSY (*Genetica [The Hague], 5 (1923), No. 1, pp. 77, 78, figs. 2*).—Differences in the color of the two eyes in the same animal, and even in certain sections of the same eye, are described in Malamute dogs, which are the inbred offspring resulting from crosses between dogs and wolves.

Additional mutant characters in Drosophila willistoni, R. M. FERRY, R. C. LANCEFIELD, and C. W. METZ (*Jour. Heredity, 14 (1923), No. 8, pp. 372–384, figs. 19*).—Six sex-linked and 23 autosomal characters in *D. willistoni* not reported in the previous paper by Lancefield and Metz (E. S. R., 48, p. 166) are described with reference to similar characters in other species where any are known.

Instability in peach varieties, G. P. WELDON (*Jour. Heredity, 15 (1924), No. 2, pp. 86–90, figs. 3*).—Observations made in California peach orchards since 1919 convinced the author that mutations occur in the peach much more frequently than usually accepted. Scattering smooth-skinned fruits were observed on trees of the Ontario variety. Two trees were found in a Lovell orchard which matured their fruit at least 10 days in advance of Lovell, but otherwise were similar to that variety. An Ontario tree was discovered one branch of which bore fruits having the suture filled with dark-colored extraneous tissue. Propagations from this limb also bore the same abnormal type of fruit. The author suggests that some peach varieties whose origin is usually ascribed to chance seedlings may have originated as mutations.

Notes by N. M. Stevens on chromosomes of the domestic chicken, A. M. Boring (*Science, 58 (1923), No. 1491, pp. 73, 74, figs. 6*).—Six drawings and a few notes dealing with the chromosomes of males of the domestic fowl, made by Miss Stevens before her death, are published.

The behavior of the nucleus and chromosomes during spermatogenesis in the robber fly Lasiopogon bivittatus, C. W. Metz and J. F. Nonidez (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 46 (1924), No. 4, pp. 153–164, pl. 1*).—A detailed description is given of the cytological changes during spermatogenesis up to the second spermatocyte division in the robber fly, based on studies of two specimens.

A preliminary statement of the results of Mr. Houwink's experiments concerning the origin of some domestic animals, II–IV, J. P. Lotsy and K. Kuiper (*Genetica [The Hague], 5 (1923), Nos. 1, pp. 1–50, pls. 2, figs. 3; 2, pp. 149–176, figs. 6; 3–4, pp. 357–375, figs. 14*).—Three additional papers in this series (E. S. R., 48, p. 867) are noted.

II. *The origin of our domestic poultry.*—This paper deals primarily with descriptions of the four species of the genus Gallus, based mainly on the work of Beebe (E. S. R., 45, p. 851). Evidence is offered in contradiction to Darwin's statement to show that fertile crosses may be produced between the domestic fowl and the four species, *G. gallus* (Red Jungle Fowl), *G. lafayetti* (Ceylon Jungle Fowl), *G. sonnerati* (Gray Jungle Fowl), and *G. varius* (Javanese Jungle Fowl). Colored plates of each species are reproduced from Beebe.

III. *The birds used in Mr. Houwink's experiments.*—The original animals employed in Houwink's experiments are described, and the material and notes on the birds produced are tabulated. A discussion of what the species *G. bankiva* consists of is given, without satisfactory conclusions.

IV. *Determination of the birds received by Mr. Houwink as bankiva's.*—Evidence is presented to indicate that the original cock and hen supposed to have been imported from India by Houwink and thought to have been of the species *G. bankiva* were not bankivas at all, but that the cock was a segregate from the cross of a Malay game or a similar domestic hen with a male *varius*. The hen could not have been a *bankiva* because of the small wattles and conspicuous serrated comb, and was probably an ordinary partridge colored bantam. A study of the inbred offspring of these parents indicated that a large number of factors are responsible for the partridge color.

Mendelian analysis of the pure breeds of livestock.—I, The measurement of inbreeding and relationship, S. Wright (*Jour. Heredity, 14 (1923), No. 8, pp. 339–348, figs. 4*).—This is a discussion of the practical application of the coefficients of inbreeding and relationship, previously noted (E. S. R., 48, p. 468). The formulas have been applied to certain theoretical pedigrees and to the pedigrees of the Shorthorn bull Favourite.

On the genetic behavior of some factors in aduki-bean, K. Miyake, Y. Imai, and K. Tabuchi (*Bot. Mag. [Tokyo], 38 (1924), No. 445, pp. 21, (1)–(9)*).—Crosses between adzuki beans with colored stems and with green stems gave rise to an F_2 generation consisting of coloreds and greens in the ratio of 9:7. The assumption of the interaction of two complementary factors was confirmed by results obtained in F_3 and F_4. One parent of this cross was self-black in the color pattern of seed coat and the other red-eyed white. The F_2 from the self-black seeded hybrids consisted of self-black, self-red, red-eyed white with black mottling on the colored part, and red-eyed white types in a 9:3:3:1 ratio. A subsequent test proved that this segregation is the result of the recombination of two factors responsible for the particular color pattern on the seed coat. All colored stems gave only self-black seeds, while all green stems gave either one of the remaining three. This is thought to be explainable by assuming the occurrence of two strong linkages between the factors for stem color and seed pattern. An alternative explanation suggested assumes the multiple effects of the factors of the stem color or those of the seed pattern.

Six cases of hypotrichosis in a family [trans. title], V. Berglund (*Hereditas, 5 (1924), No. 1, pp. 44–48, fig. 1*).—A family is described in which the father and 5 of his 10 children, one-half of which were by each of two wives, never had any hair on their heads. The abnormal condition is explained as due to a dominant Mendelian factor for which the father was heterozygous, whereas the two wives were homozygous for the recessive allelomorph (normal hair).

The heredity of coat color in horses [trans. title], A. Molhant (*Jour. Soc. Natl. Agr. Belg., 5 (1923) Nos. 47, pp. 369, 370; 48, pp. 378, 379*).—On the basis of the results of other investigators, coat color in horses is attributed to more or less interaction between 11 independently inherited genes.

The absence of one kidney associated with hereditary abnormalities in the descendants of X-rayed mice, H. J. Bagg (*Soc. Expt. Biol. and Med. Proc., 21 (1923), No. 3, pp. 146–149, figs. 2*).—In experiments carried on at the Memorial Hospital and Cornell University Medical College, New York City, the offspring of X-rayed male and female rats have been found to show eye deformities which genetic tests indicated were determined by a Mendelian recessive. Of 300 of these rats on which autopsies were made 46 showed a complete lack of one kidney and in 4 others one kidney was almost entirely lacking. Genetic experiments so far "have shown that the kidney abnormality may be greatly increased in the experimental stock by breeding from animals heterozygous for this condition."

Another instance of defective endosperm in maize, R. J. Garber and B. L. Wade (*Jour. Heredity, 15 (1924), No. 2, pp. 69–71, figs. 2*).—The inheritance of a defective endosperm discovered in a self-fertilized strain of Leaming corn is described in this contribution from the West Virginia Experiment Station. The defective seeds were undersized and could be distinguished also by their milky appearance and slightly wrinkled pericarp, particularly near the crown. The normal seeds were corneous and had a distinct luster. The abnormal seed produced plants which were stunted and slender and somewhat later in maturing than the normal plants. According to the evidence the inheritance of this defective endosperm seems to be controlled by a single factor difference.

The inheritance of smut resistance in crosses of certain varieties of oats, A. F. Barney (*Jour. Amer. Soc. Agron., 16 (1924), No. 4, pp. 283–291, pls. 2*).—That some varieties of oats contain one factor pair for resistance to loose smut, that other varieties contain two independent factor pairs, and that in other varieties three factor pairs may be concerned with resistance are indicated by data obtained at Cornell University.

Selection within 70 families from the crosses Early Ripe×Black Mesdag and Sixty-Day×Black Mesdag gave evidence that resistant families can be isolated in the second generation which breed true to that characteristic through the F_3, F_4, and F_5 generations. Likewise, highly susceptible families can be isolated which breed true. Such results are held to show the possibility of obtaining desirable types of smut resistant oats from crosses between resistant and susceptible varieties.

The inheritance of a lethal pale green seedling character in maize, A. M. Brunson (*New York Cornell Sta. Mem. 72 (1924), pp. 5–22, pl. 1*).—The pale green seedling described arose from a selfed ear from the "high yield" strain grown by the Illinois Experiment Station. So far as observed the pale green plants always die in the seedling stage.

The character pale green segregated as a simple Mendelian recessive, and the symbols Pg_1 pg_1 were assigned to the factor pair involved. In crosses involving colored aleurone the factor Pg_1 was shown to be linked with either *C* or *R*.

Formulas were developed for calculating linkage intensities from F_2 populations involving complementary factors, one of which is linked with a third factor. Substituting observed frequencies in these formulas, an average value of 23.3 per cent of crossing-over is obtained. Evidence from crosses involving the factors for shrunken endosperm and for inhibition of red stems in the seedlings are held to show conclusively that the aleurone factor linked with pg_1 is *R*. The limited available data seem to indicate that the order of the genes is pg_1-R-g-li_1, which if substantiated will materially increase the known length of this chromosome.

X-rays and crossingover, J. M. MAVOR and H. K. SVENSON (*Science, 58 (1923), No. 1494, pp. 124–126, fig. 1*).—In continuing the study of the effects of X-rays on crossing-over in *Drosophila melanogaster* (E. S. R., 50, p. 529), the results of two additional experiments are reported between black and purple and purple and curved, factors located in the second chromosome. The crossing-over in these regions was found to be materially increased by the treatment, especially in eggs laid more than three days after X-raying the females. The maximum amount of crossing-over occurred in eggs laid from 6 to 9 days after the treatment, with gradual decreases up to the eighteenth day, when the females were destroyed. An accelerated development of the eggs is suggested as the cause of the increased crossing-over, and the results are compared with those on the effect of temperature on crossing-over as found by H. H. Plough.

On the function of secondary sexual characters, J. C. MOTTRAM (*Sci. Prog. [London], 18 (1924), No. 71, pp. 420–425*).—A brief discussion of the importance of secondary sexual characters in the evolution of animal differentiation is discussed with special reference to the naturally more attractive colors and actions of the less valuable sex in nature.

Influence of heredity on sex control, J. S. MOORE (*Jersey Bul. and Dairy World, 43 (1924), No. 16, pp. 696, 697*).—The offspring of certain cows in the Mississippi Experiment Station herd have indicated that there might be a tendency of certain individuals to produce one sex more frequently than others, and certain evidence was obtained to indicate that this condition was hereditary for a few generations. The offspring in future generations, however, did not bear this out.

The factors governing the mammalian sex-ratio, A. S. PARKES (*Sci. Prog. [London], 18 (1924), No. 71, pp. 426–435*).—This is a discussion of the factors governing the sex ratio in mammals. The ratio at conception is thought to be controlled by the sex chromosones, but this may be modified by an unequal elimination of one sex by abortion or by absorption of fetuses or by a differential post-natal mortality so that different ratios at birth and maturity may be observed. The effect of various factors, such as suckling, age of dam, etc., on the ratio are described as possible through an unequal elimination of the sexes.

Sex ratios in poultry, F. E. MUSSEHL (*Poultry Sci., 3 (1923–24), No. 2, pp. 72, 73*).—In chicks of three breeds, 1,514 Single Comb White Leghorns, Barred Rocks, and Single Comb Rhode Island Reds raised at the Nebraska Experiment Station were found to be 52.24 per cent males. The sex ratios of each breed during the first and last half of the hatching season, while showing some variation from the average, showed no significant differences. The sex ratios of the offspring of 4 individual White Leghorn males showed rather wide fluctuations from the total averages, going as low as 36 per cent of males in the offspring of one rooster and as high as 59 per cent of males in the offspring of another rooster. The author concludes from the data presented that the chromosome theory of sex determination is well grounded.

The parthenogenetic development of eggs in the ovary of the guinea pig, L. Loeb (*Science, 58 (1923), No. 1489, pp. 35, 36*).—The author gives a general description of cases of parthenogenetic development of ova in the ovaries of guinea pigs which have now been found in over 30 animals at the Washington University. Special efforts to cause parthenogenetic development of ova in other guinea pigs have been unsuccessful.

Sterilities of wild and cultivated potatoes with reference to breeding from seed, A. B. Stout and C. F. Clark (*U. S. Dept. Agr. Bul. 1195 (1924), pp. 32, pls. 8*).—Varieties and seedlings of potatoes were grown at Presque Isle, Me., and at the New York Botanical Garden, and the several types of sterility were studied.

The nonblooming habit of the potato with early abscission of the flower buds and flowers when grown under certain conditions is said to be a direct influence of environment. Varieties which bloom in profusion in northern Maine were rarely or never seen to bloom at the New York Botanical Garden. This habit appears to be a most decided limitation to fruit production, irrespective of the condition of pistils and stamens when flowers are produced. Relatively few of the cultivated varieties and seedlings produce viable pollen in considerable quantities and can function as pollen parents, and the highest potency of pollen in these is decidedly low. However, nearly all varieties, if not all, are able under conditions of favorable blooming to produce seed balls in response to proper pollination with viable pollen. As a group the cultivated potato varieties exhibit a one-sided sterility which chiefly involves maleness.

No conclusive evidence of a real physiological incompatibility in the fertilization of cultivated varieties exists, but there is positive evidence of such sterility in the wild species, *Solanum chacoense*. F_1 of *S. fendleri*×*S. chacoense* appear to be completely impotent as males and also as functional females. Breeding from seed in potatoes can best be undertaken when varieties bloom in profusion, under which conditions success in obtaining seeds depends chiefly on the use of viable pollen. According to this study, pollen in anthers of fully mature flowers of any one variety appears to be very constant in quantity, range of abortion, general character, and viability. The production of tubers in which much food is stored does not seem to directly influence and prohibit the formation of fruit by the potato.

A fertile mare mule, W. L. Stangel (*Breeder's Gaz., 85 (1924), No. 3, p. 77, fig 1*).—An account is given of a mare mule that produced a foal when bred to a jack, and later, at the Texas Experiment Station, produced another foal when bred to a saddle stallion.

A universal card system for family pedigrees, H. J. Banker (*Jour. Heredity, 14 (1923), No. 8, pp. 352–358, figs. 5*).—A system of uniform card records of family pedigrees is suggested in which it is only necessary to have separate cards for males having children.

FIELD CROPS.

Field experiments in electroculture, V. H. Blackman (*Jour. Agr. Sci. [England], 14 (1924), No. 2, pp. 240–267*).—Experiments, reported in part from another source (E. S. R., 49, p. 224), are described in greater detail. Earlier tests have been noted (E. S. R., 37, p. 336).

The mode of action of the current in producing increased growth and yield is held to be still obscure. In several cases the electrified field crops exhibited a deeper green tint than that of the controls, and it has been shown that in the case of the coleoptile of barley minute electric currents are able to bring about an increase in the rate of growth. The effect of the discharge seems to be of the nature of a stimulus. The additional energy available from the current is too small to have any direct effect, since it is only about $\frac{1}{1000}$ or less of the energy which the plant obtains from sunlight. There is no evidence that gaseous products of the discharge play any part in the stimulation of growth. The additional supply of nitrogen brought to the soil from oxids of nitrogen produced as a result of electrification must be exceedingly small.

Pot culture experiments with an electric discharge, V. H. Blackman and A. T. Legg (*Jour. Agr. Sci. [England], 14 (1924), No. 2, pp. 268–286, pl. 1*).—The principal findings in pot cultures with wheat, barley, and corn, already extensively noted (E. S. R. 50, p. 131), are held to harmonize with the results of field experiments reported above.

[Agronomic experiments at Forli, Italy], A. Sintoni, A. Draghetti, M. Soave, and C. Bocchi (In *R. Laboratorio Autonomo di Chimica Agraria Forlì. Annuario, 1912–1921. Piacenza: Fed. Ital. Consorzi Agrari, 1922, pp. 29–99, 137–199, figs. 9*).—Experimental work with field crops reported on from the Agricultural Experiment Station and Autonomous Agricultural Chemical Laboratory at Forlì, Italy, includes studies of the characteristics, adaptation, resistance to lodging (E. S. R., 48, p. 232), and physical and chemical characters of the grain of varieties and selections of wheat; selection work with wheat, corn, and alfalfa; variety trials with corn and potatoes; fertilizer tests with wheat and sugar beets; analyses of sugar beets in successive growth stages and of corn grain; and observations on several instances of vicinism in wheat.

[Field crops experiments in India, 1922–23] (*India [Dept. Agr.] Rev. Agr. Oper., 1922–23, pp. 2–29, 30–36, 41–49, 57–59, pls. 2*).—Investigations with field crops (E. S. R., 49, p. 526) carried on by the Imperial and Provincial Departments of Agriculture in different centers in India are summarized for the year 1922–23.

Monographs on grasses—I, Lolium [trans. title], J. Hessing (*Meded. Landbouwhoogesch. [Wageningen], 25 (1922), No. 1, pp. 72, pls. 19, figs. 2*).—This monograph deals with the botanical relationships and characteristics of Lolium and the species *L. temulentum, L. remotum, L. perenne,* and *L. multiflorum.*

The grasses of Hawaii, A. S. Hitchcock (*Mem. Bernice Pauahi Bishop Mus., 8 (1922), No. 3, pp. [5]+101–230, pls. 5, figs. 110*).—This account of the grass flora of Hawaii, prepared for publication by the U. S. Department of Agriculture, contains descriptions of the genera and species with notes on the distribution and agricultural status of the species, keys to the tribes and genera, and a general discussion on ecological areas, agricultural grasses, and native and introduced species. A catalogue of specimens cited is included, together with a list of new species and new names.

Effect on permanent pastures of treatments with limestone and acid phosphate as measured by the quantity and quality of the vegetation produced, E. E. Barnes (*Jour. Amer. Soc. Agron., 16 (1924), No. 4, pp. 241–251, figs. 2*).—About 400 lbs. of acid phosphate and 2 tons of limestone per acre were applied to pasture fields in experiments conducted by the Ohio State

University in four counties in southeastern Ohio, and yield data and botanical and chemical analyses of the resulting growth were obtained.

The total vegetation produced per acre on the treated portions of these pasture fields was from three to five times as much as on the untreated portions, except where the sod had been injured by moles during the previous winter, and from five to seven times as much crude protein was produced per acre on the treated as on the untreated portions The vegetation on the fields which had much Japan clover in the turf showed a greater percentage gain in both calcium and phosphorus content as a result of the treatment than did the vegetation on a field of the same age but containing no Japan clover. The vegetation on the field which included a large amount of sweet clover was found to contain, as a result of the treatment, much larger percentages of both calcium and phosphorus than did that on the untreated area. Where the principal legumes were red clover and white clover, the treatment did not materially influence the percentage content of phosphorus in the herbage, but did greatly augment the amount of vegetation produced.

The immediate effect of treatments of limestone and acid phosphate on "worn out" pastures in southeastern Ohio seems to be a marked increase in the percentage of legumes, followed later by a renewal of the blue grass sod, which does not reach its optimum until at least the end of the fourth summer after treatment. The greatest difference in chemical composition between the vegetation produced on treated and untreated portions of the same field is apparently found in the percentage content of nitrogen. The percentage increase in the content of calcium in the vegetation as a result of an acid phosphate and limestone treatment is greater than the percentage increase in its content of phosphorus.

Lawns, links, and sportsfields, J. MacDonald (*London: Country Life, Ltd.; New York: Charles Scribner's Sons, 1923, pp. IX+78, pls. 8, figs. 18*).—Designed primarily for the British Isles, this book deals with methods and practices for establishing and maintaining lawns, golf courses, tennis courts, bowling greens, croquet lawns, cricket grounds, and fields for football, hockey, and polo. Lawn pests are also touched on.

Root development of lucerne, B. M. Davis (*New Zeal. Jour. Agr., 28 (1924), No. 3, pp. 179, 180*).—The root development of alfalfa under varying conditions of water supply and fertility was studied at Canterbury University College. Different series of plants received equivalents of 15, 30, and 60 in. of rainfall per annum, respectively, and were given superphosphate at the rate of 2 cwt. per acre and untreated. Examinations were made after 4, 8, and 20 weeks from germination.

The main taproots of plants receiving fertilizer penetrated deeper than those of untreated plants when both lots received 30 and 60 in. of rain, whereas the reverse was true with 15 in. of rain. The laterals and taproots were somewhat smaller in diameter in the plants receiving fertilizer than in those receiving none. No regular difference was ascertained as regards the diameter quotient, i. e., the relative diameters of cortex and conducting tissues. An increased amount of root was seen to develop in the surface soil in the case of those plants receiving fertilizer. The reverse was true in this investigation for the 20-week plants. Superphosphate did not result in the production of an increase in the total root production, but seemed to exercise a depressing effect when combined with either heavy or light rainfall.

Application of superphosphate did not alter the efficiency of the roots with 30 in. of rain, whereas the efficiency became very much greater with 15 and 60 in. Superphosphate adversely affected the germination of the seed.

Winter hardiness of medium red clover strains, A. C. Arny (*Jour. Amer. Soc. Agron., 16 (1924), No. 4, pp. 268–278*).—In comparative trials at the Minnesota Experiment Station, medium red clover seed produced in the northern tier of the North Central and the North Intermountain States gave uniformly low percentages of winterkilling and averaged good yields of hay in both the first and second cuttings, while seed grown in Tennessee and Oregon did not give as uniformly satisfactory results as that produced farther north. Strains coming from northern Europe winterkilled to a greater extent that the northern grown native strains, but on most of the plats enough vigorous plants remained to give good yields. A strain from Australia was more variable in behavior than the northern European strains. Strains of medium red clover seed produced in France, Chile, and Italy winterkilled 81, 89.5, and 93.8 per cent, respectively, and no measurable yields of hay were obtained. The value of northern grown native strains for the northern tier of States is emphasized.

Improvement work with corn at the Experimental Station for Corn Culture of Bergamo [trans. title], T. V. Zapparoli (*Italia Agr., 60 (1923), No. 12, pp. 446–458, figs. 14; also Bergamo Staz. Sper. Maiscolt. [Pub.] 3 (1923), pp. 15, figs. 14*).—The progress of breeding work with corn at Bergamo, Italy, is reported, with a discussion of the inheritance of abnormalities appearing among the progeny of self-pollinated ears.

Cotton production: Factors affecting earliness and yield, C. P. Blackwell and T. S. Buie (*South Carolina Sta. Bul. 219 (1924), pp. 48, figs. 9*).—Variety and fertilizer experiments and fruiting studies concerned with the production of an early crop of cotton in South Carolina are reported in detail. See also earlier accounts (E. S. R., 50, pp. 637, 638, 639).

Fertilizer tests on seven leading soil types in the State showed a properly balanced fertilizer to produce the earliest crop and highest yield, with application of 600 to 800 lbs. per acre giving the most profitable returns. Nitrogen was the prime limiting factor in cotton production, and phosphorus was the next. Both influenced the earliness of the crop. Small amounts of potassium increased the yield, while heavy applications tended to delay maturity and reduce the yield. Sodium nitrate as side dressing gave the best results in 1923 when applied 10 days after chopping, each increase in the rate of application up to 300 lbs. per acre—the maximum applied—augmenting the yield. Sodium nitrate and ammonium sulphate gave the best results as a dressing to cotton, and ammonium nitrate was also very stisfactory.

During four years Cleveland (Piedmont) gave the highest average yield at Clemson College, and Dixie-Triumph, Cleveland (Coker), and Cleveland (Wannamaker) at the Pee Dee Substation, while at the Coast Substation, under heavy boll weevil infestation for three years, the best average yields were made by Cleveland (Coker) and Cleveland (Wannamaker). The best long staple variety has had a higher acre value, as an average of the past four years, than the best short staple variety, but if the average yields and present premium on long staple are considered, the short staple is more valuable per acre. Rather close spacing of cotton has given the best results.

Detailed fruiting studies of the cotton plant in 1923 showed that, while Cleveland did not begin blooming as early as some varieties, by midseason and until the end of the year it had set more lint cotton per stalk than any other variety. Sugar Loaf and Cleveland had the shortest boll periods. Bolls from early season blooms developed more rapidly than those from late blooms. Stripping all squares from plants in different stages of growth seemed to stimulate blooming, but fewer of these late blooms matured. Rates of blooming on fertilizer plats were in almost direct relation to final yields.

Cotton growing in South Africa, G. F. Keatinge (*London: Empire Cotton Growing Corporation, 1923, pp. 67, pl. 1*).—Based on a survey, historical, environmental, agricultural, and economic factors concerned in the production and marketing of cotton in South Africa are reviewed, and the characteristics of present and potential cotton districts are described. Investigational work, insect pests, and plant diseases and the prospects of the industry are commented on briefly with recommendations. A note on cotton growing in the Transvaal east of the Drakensberg Mountains is appended.

A preliminary study of the demand for various types of Indian cotton, B. C. Burt (*[Indian Cent. Cotton Com., Bombay] Bul. 2 (1923), pp. [1]+23, pls. 6*).—In this edition of a report noted earlier (E. S. R., 49, p. 131), the statistical matter is revised and brought up to date.

The moisture relations of cotton, A. R. Urquhart and A. M. Williams (*Jour. Textile Inst., 15 (1924), No. 3, pp. T138–T148, figs. 4*).—Studies of the hygroscopic properties of cotton were made under the auspices of the British Cotton Industry Research Association.

Raw cotton dried by heating at 110° C. (230° F.) was found to lose more weight than that dried in a vacuum desiccator over phosphorus pentoxid at an average of 15°. This might be due to the loss of some constituent of the noncellulose impurities of raw cotton, for so far as loss of weight was concerned soda-boiled cotton showed no difference between the two methods.

Investigation of the moisture relations of raw and soda-boiled cotton at 20° showed that the moisture regain of cotton in equilibrium with any atmosphere depends on the condition of the cotton previous to its introduction into that atmosphere. The moisture regain of cotton depends on its previous heat treatment, heating to a high temperature reducing the capacity of the material to absorb water. Soda-boiled cotton takes up considerably less water in absorption and shows a greater hysteresis than raw cotton.

Cotton fiber length v. stapling length, H. B. Gordon (*Textile World, 64 (1923), No. 15, pp. 39, 41, 43, 45, figs. 2*).—The average length of fibers was determined in a number of samples of raw cotton and in yarn and cloth made from some of them. The average length of fibers in raw American cotton appeared to be essentially the same as the staple length. The decrease in length of fiber in manufacture seemed very slight, probably 0.02 in. Nearly the same variation in length of fiber was found in samples of long and short staple American cotton.

The advantages and disadvantages of measuring individual fibers and staples of fibers in determining the length of staple cotton from which goods are made are discussed.

Some physical tests on sized yarns, A. E. Owen (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 2 (1923), No. 21, pp. 263–277, pl. 1, figs. 13*).—Unsized cotton yarns and similar yarns variously sized were compared with regard to their ability to resist oscillating tensions in this contribution from the British Cotton Industry Research Association. An improved form of oscillating stress tester was employed.

Sizing was found to greatly enhance resistance to repeated variations of tension, and it is inferred from the material examined that the differences in the extent to which this property is given by different size mixings are probably slight compared with variations due to inherent differences between samples of yarn of reputed equality and are therefore of no practical significance. Measurements of extensions produced in sized and unsized yarns by oscillations of tension exhibit, when expressed in the form of curves, a striking qualitative difference which is interpreted as indicating a cementing action of the size. The apparent equality of different sizings is explained on the assumption that in all cases the cementing action is complete or on the average equally approximate. The increased resistance to the deteriorating effect of oscillations of tension which results from sizing is shown to be accompanied by a reduction in the ultimate extension of the yarn, another desirable quality.

Notes on American Lespedezas, S. F. Blake (*Rhodora, 26 (1924), No. 302, pp. 25–34, figs. 2*).—*L. procumbens elliptica, L. violacea prairea, L. stuevei, L. stuevei angustifolia, L. frutescens, L. intermedia hahnii,* and *L. hirta appressipilis* are discussed briefly.

List of names of the varieties of the potato known to have been grown or tested in Great Britain, together with their synonyms (*Scot. Bd. Agr. Misc. Pub. 4 (1924), pp. 50*).—This list includes 496 distinct potato varieties, 741 synonyms, and 464 varieties regarding which no information is available, with immunity from wart disease indicated. Abundance has 95 synonyms, Arran Chief 15, British Queen 75, Duke of York 31, Great Scot 11, King Edward VII, 13, Myatt Ashleaf 14, President 19, Sharpe Express 19, Snowdrop 10, and Up-to-Date 175.

Improvement of rice [trans. title], N. Novelli (*Gior. Risic., 14 (1924), No. 2, pp. 17–39, figs. 19*).—The characteristics and behavior of a number of improved varieties of rice are described.

Sorghum: Its history and uses, A. Piedallu (*Le Sorgho: Son Histoire, ses Applications. Paris: Challamel, 1923, pp. VIII+389, pls. 16, figs. [71]*).—This volume deals with the history, botanical relations, classification, geographical distribution and adaptation, cultural requirements, uses, and parasites of the sorghums, including the sorgos, grain sorghums, Sudan grass, Johnson grass, and broom corn. Attention is given the toxic principles of sorghum, use of sorghum in making paper pulp, sorghum grain and flour, sorghum beer, and the coloring matter of sorgo and the techinque of dyeing. A comprehensive bibliography is appended.

The sorghums in Arizona, G. E. Thompson (*Arizona Sta. Bul. 98 (1923), pp. 41–66, figs. 8*).—Cultural methods, field practices, varieties, and environmental conditions considered suitable for growing the grain sorghums, sorgos, and related crops under irrigation and dry farming in Arizona are discussed, with remarks on uses and diseases.

Soybeans: Their culture and uses, C. F. Noll and R. D. Lewis (*Pennsylvania Sta. Bul. 187 (1924), pp. 15, fig. 1*).—Investigations with soy beans are reviewed, with varietal and cultural recommendations. The experimental results, excepting several years of varietal comparisons, have been noted in detail (E. S. R., 45, p. 433).

Comparative experiments with sugar beets in Czechoslovakia [trans. title] (*Ztschr. Zuckerindus. Čechoslovak. Repub., 48 (1923), No. 12, pp. 89–95; 48 (1924), No. 13–14, pp. 97–102*).—Eight varieties of sugar beets were grown in comparison in five localities in Bohemia and in three in Moravia. The Schreiber variety led in average yields and sugar production, being followed by Dobrowitz and Zapotil. Dippe possessed the maximum average sucrose content. Dobrowitz showed the greatest resistance to premature seed production, with Schreiber, Zapotil, and Strube following in order.

Experiments with varieties of sugar cane, 1920–22, together with a summary of the results from 1917–22, H. A. Tempany et al. (*Mauritius Dept. Agr., Gen. Ser., Bul. 30 (1924), Eng. ed., pp. 14*).—Extensive varietal trials (E. S. R., 46, p. 535) throughout Mauritius during the period 1917–1922 have shown the reliability of D/109, R. P. 8, R. P. 6, 33/231, D. K. 74, B. 6308, 55/1182, 55/453, POJ 213, R P. 73, B. 6450, B. 3390, 188^{07}, 33/187, 33/55, and 15^{94}. M. 2617, M. 2117, and M. 2316, with average yields of about 6.64, 6.25, and 5.72 tons of sucrose per acre, respectively, led the varieties tested in 1920–1922. Tabular descriptions are given for seedlings and varieties compared.

Statistics on the distribution and production of sugar cane varieties in Java in 1923–24 [trans. title], J. VAN HARREVELD (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1924, No. 1, pp. 24*).—The tabulations supplement similar data reported earlier (E. S. R., 50, p. 32). The leading varieties included EK 28, DI 52, 247 B, EK 2, 100 POJ, 90 F, SW 3, 2714 POJ, and 2725 POJ, occupying, respectively, 43.5, 22.5, 12.5, 6.25, 1.5, 3, 3, 2.25, and 0.5 per cent of the total acreage planted to sugar cane in the island of Java.

Report of the committee appointed by the treasury to enquire into the industry of tobacco growing in Great Britain, N. E. YOUNG ET AL. (*London: Govt., 1923, pp. 25*).—Consideration of historical facts, effects of legislation, various attempts at revival by means of state aid and other methods, and the present condition of the home industry led to the view that nothing more than a low grade tobacco will be grown generally in Great Britain. Foreign competition, the capital expenditure required, and, except on limited areas, better existing crops combine to restrict its culture.

The determination of the species of vetch from the size of the hilum [trans. title], W. SWEDERSKI (*Rocz. Nauk Rolnicz., 11 (1924), No. 1, pp. 44–51*).—Studies by the author suggested the value of the relation between the size of the hilum and the circumference of the seed, tabulated for 52 species of Vicia, in differentiating seed of different species of vetch.

Development of wheat plants from seminal roots, L. F. LOCKE and J. A. CLARK (*Jour. Amer. Soc. Agron., 16 (1924), No. 4, pp. 261–268, figs. 4*).—Under normal conditions seminal or seed roots and coronal or permanent roots are developed by the wheat plant. In instances cited in this contribution from the Bureau of Plant Industry, U. S. D. A., physical conditions were observed to prevent or delay the development of the permanent roots. At Nephi, Utah, in 1919, packing, drying, and crusting of the soil prevented normal development of the permanent roots, and at Woodward, Okla., in 1922, extremely dry surface soil prevented penetration of the permanent roots. Under these conditions the seminal roots are said to have furnished sufficient moisture to maintain the growth of the wheat plant to maturity, or until rains occurred and permanent roots developed normally.

The tillering of wheat [trans. title], D. VIGIANI (*Staz. Sper. Agr. Ital., 56 (1923), No. 7–9, pp. 341–350*).—Twenty-eight varieties of wheat grown in Italy were compared and classified as to tillering power.

Colloidal properties of winter wheat plants in relation to frost resistance, R. NEWTON (*Jour. Agr. Sci. [England], 14 (1924), No. 2, pp. 178–191, pl. 1, figs. 2*).—Further investigations on the nature of frost resistance in winter wheat (E. S. R., 47, p. 38), which have been carried on during the seasons of 1921–22 and 1922–23 at St. Paul, Minn., and Edmonton, Alta., are reported in part. The following varieties of winter wheat were used, named in order of their winter hardiness: Minhardi, Buffum, Turkey (Minn. No. 1487), Kanred, Super, and Fulcaster. From their behavior at St. Paul, the first two may be classed as hardy, the next two as semihardy, and the last two as nonhardy.

Certain colloidal properties of winter wheat plants were found to be closely related to frost resistance and to provide indexes of hardiness which may have practical application in the breeding and selection of hardy varieties. The imbibition pressure of fresh leaves in the winter-hardened condition was found in most cases to be directly related to hardiness. The volume of press juice obtained per 100 gm. of hardened leaves was inversely proportional to the hardiness of a variety. This volume is largely determined by two hardiness factors, the dry matter content and the imbibition pressure of the leaves. When unhardened leaves were used, no relation could be found between imbibition pressure or volume of press juice and hardiness.

The imbibition pressure of hardened leaves appears to depend on the physical state of the cell colloids characteristic of living tissues, since this property was lost when the tissues were killed. The moisture content of hardened tissues tends to be inversely proportional to hardiness. There is some evidence that in hardy varieties it fluctuates less with changes in weather conditions, and a possible explanation of this as a colloidal property is suggested. The quantity of hydrophilic colloids contained in the press juice, as measured by its effect on the activity of water, was found to be directly proportional to hardiness.

Control of imported seeds and plants, J. N. Whittet (*Agr. Gaz. N. S. Wales, 35 (1924), No. 2, pp. 110–114*).—The methods adopted in New South Wales to control the importation of seeds and plants are outlined briefly.

Dodder and its removal from clover seed, C. B. Saunders (*Jour. Min. Agr.* [*Gt. Brit.*], *30 (1924), No. 10, pp. 928–931*).—Examination of the records of the Official Seed Testing Station for England and Wales reveals that small seeded dodder, *Cuscuta trifolii* (E. S. R., 49, p. 530), is probably decreasing in England owing to the greater attention paid to cleaning. This seed can be easily removed from red clover by screening. Large seeded dodder (forms of *C. racemosa*) appears to be increasing and may possible be gradually acclimatizing itself. It can not be easily removed from red clover by screening, but a new process of magnetic separation, outlined in this article, seems to promise a simple and economic means of overcoming this difficulty.

HORTICULTURE.

The growing of plants from seeds, E. Benary (*Die Anzucht der Pflanzen aus Samen im Gartenbau. Berlin: Paul Parey, 1923, 3. ed., rev., pp. VIII+355*).—This book comprises a general discussion of vegetable and ornamental plant growing.

The quality of packet seed on sale in New York, M. T. Munn and E. F. Hopkins (*New York State Sta. Bul. 507 (1924), pp. 3–23*).—Germination tests with vegetable seeds taken from 347 sealed packets obtained in open markets of the State showed 23 per cent of the packets to contain such poor quality seed as to be worthless for planting. In general, all the seeds originating with a single dealer or seedsman, were of the same standard of quality, indicating a correlation between the character of the seedsman and the character of his product. The authors urge the necessity of a State seed law to enforce the labeling of vegetable seeds and to provide for their official examination. The results of the tests are presented in tabular form.

[Horticultural investigations at the Cap Rouge, Que., Experimental Station], G. A. Langelier (*Canada Expt. Farms, Cap Rouge (Que.) Sta. Rpt. Supt. 1922, pp. 19–61, fig. 1*).—In this report, consisting chiefly of varietal data on fruits, vegetables, and ornamentals, there are included the results of miscellaneous tests.

Yield records taken on 39 individual plants of the Donald Elmira asparagus showed a great range in productivity. Individual plant selection of the Pencil Pod garden bean resulted in the isolation of productive strains which showed a tendency to maintain this superiority. Five years' studies in the thinning of garden beets indicated that 2- and 3-in. spacing is the most favorable in respect to yield. Plant selection with Danish Roundhead cabbage yielded a high-producing strain. Chantenay carrots thinned to 1 in. apart were more productive than those thinned 2 or 3 in. A comparison of soil, boards, and paper for blanching celery showed the highest returns and quality from soil banking. Onions thinned to 2 in. in the row were more productive than those at 1 or 3 in. Two in. also proved the best spacing for parsnips.

. An early maturing selection from Earliana tomato proved so satisfactory as to be designated under the name Caplana. Tomatoes trained to horizontal wires were more productive than plants trained to stakes. Unpruned tomatoes gave more than twice the yield of plants pruned in various ways.

[Horticultural investigations at the Ste. Anne de la Pocatière, Que., Experimental Station], J. A. STE. MARIE (*Canada Expt. Farms, Ste. Anne de la Pocatière (Que.) Sta. Rpt. Supt. 1922, pp. 12–24*).—This report consists largely of data taken in miscellaneous cultural and varietal tests with fruits, vegetables, and ornamentals. Hollow Crown parsnips thinned to 2 in. between plants yielded more than those thinned to 3 or 4 in. Similar results were secured with carrots and beets, indicating that reasonably thick plantings are preferable. In a comparison of pruned and unpruned tomato plants, the unpruned greatly outyielded the others.

[Horticultural investigations at the Dahlem Station], KOCHS and HÖSTERMANN (*Landw. Jahrb., 57 (1922), Ergänzungsb. 1, pp. 68, 69, 112–116, fig. 1*).—Attempts to preserve ripe tomatoes by placing them in dry salt and in various salt solutions failed to give satisfactory results. In dry salt the fruits shriveled badly and took on an extremely bitter, salty taste. In salt solutions the tomatoes also took on a salty flavor and became soft, but held their shape. Soaking in fresh water failed to remove the salt, and the original flavor was found to be completely lost.

An investigation of the value of increasing the carbon dioxid content of greenhouse air indicated that yields of cucumbers could be favorably influenced by such treatment. The growth differences between the treated and control plants were, however, insignificant. The leaves of the carbon dioxid treated plants were of a slightly more intense green color. In respect to yield, the greatest differences occurred during the first 16 days of production.

More vegetables from the home garden, F. W. GEISE and V. R. BOSWELL (*Md. Univ. [Agr.] Ext. Bul. 34 (1924), pp. 76, pl. 1, figs. 14*).—In connection with a general discussion of garden planting and care, brief cultural directions are given for specific vegetables.

Culture of asparagus, F. H. HALL (*N. Y. Agr. Col. (Cornell) Ext. Bul. 81 (1924), pp. 12*).—This comprises general cultural information.

The effect of the depth of planting upon the development of asparagus [trans. title], A. PETIT (*Rev. Hort. [Paris], 96 (1924), No. 4, p. 84*).—Records taken upon the development of asparagus planted at various depths ranging from 10 to 40 cm. (3.9 to 15.7 in.) showed the greatest development of both roots and tops on those plants set at 25 cm.

Onion growing in North Dakota, A. F. YEAGER (*North Dakota Sta. Bul. 173 (1924), pp. 12, figs. 7*).—Although consisting for the most part of general cultural information, data are presented on miscellaneous tests. A comparison in 1922 of onion sets and seed of three varieties showed that seed slightly out-yielded the sets in two instances. In three out of four years transplanted onions greatly outyielded seed onions. However, it was emphasized that the cost of growing transplanted onions is excessive. Time of planting tests in 1921, 1922, and 1923 showed that early sowing is an important factor in the production of large onion yields.

New fruits, R. WELLINGTON (*N. Y. State Hort. Soc. Proc., 69 (1924), pp. 66–72*).—Descriptions are presented of several new varieties of fruits, many of which were developed at the New York State Experiment Station and which are deemed of promise for the fruit growing industry.

Fruit stocks [trans. title], G. FICHTER and E. REINISCH (*Mölers Deut. Gärt. Ztg., 37 (1922), Nos. 22, pp. 173–175, figs. 4; 23, pp. 184–187, figs. 3*).—This is a general discussion of stocks for various deciduous fruits, including the apple, pear, plum, peach, cherry, and apricot. The author points out the various influences which the stock exerts upon the scion and urges the use of clonal varieties of stocks in order to overcome variability.

[Horticultural investigations at the Geisenheim Station], E. JUNGE, K. KROEMER, and KRAMER (*Landw. Jahrb., 57 (1922), Ergänzungsb. 1, pp. 17–21, 59–62*).—A comparison of nine trees of the Madame Verte apple propagated from a high-yielding parent with nine other trees propagated from a low-yielding parent showed at the end of the first 15 years no significant difference between the two groups, leading to the conclusion that the original differences in parents were due either to soil or stock variability.

Data are presented upon the date of fruit bud formation in several varieties of apples, pears, and cherries.

Orchard spraying, L. M. PEAIRS and E. C. SHERWOOD (*West Virginia Sta. Circ. 36 (1924), pp. 20*).—General information is presented on the preparation and application of various spraying materials for the control of insect and fungus pests. Spray calendars are included for the apple, peach, and plum and cherry.

Successful spraying and how to achieve it, P. J. FRYER (*London: Ernest Benn Ltd., 1923, pp. 154, figs. 82*).—A handbook of general information for the fruit grower, presenting information relative to spraying materials, their preparation, application, and particular uses.

The use of nitrogen in the apple orchard, H. D. HOOKER, JR. (*Ill. State Hort. Soc. Trans., n. ser., 56 (1922), pp. 176–193*).—In addition to discussing the growth and fruiting responses of the apple tree to nitrogen fertilizers, the author makes practical suggestions for their use.

Flesh collapse in apples (*Fruit World Australasia, 25 (1924), No. 4, p. 175*).—A preliminary report upon cold storage experiments carried on by the Cawthron Institute at Nelson, New Zealand.

Sturmer apples picked in three stages of maturity showed the smallest percentage of flesh collapse in immature fruit. However, the author points out that care should be taken not to pick fruit so early as to interfere with its ultimate market quality. No differences were observed whether apples were stored in tightly or loosely boarded containers. Mature Sturmer apples placed immediately in cold storage showed markedly less collapse than similar fruits held outside in cool sheds for several weeks previous to storing. Determinations of carbon dioxid in the storage chambers showed a maximum of 1.5 per cent. The percentage in closely boarded cases was identical with that in the atmosphere surrounding the cases. No accumulation of carbon dioxid was found in any part of the storage rooms.

Twenty years' profit from an apple orchard, U. P. HEDRICK (*N. Y. State Hort. Soc. Proc., 69 (1924), pp. 59–65*).—The completion of the second decade (E. S. R., 31, p. 46) of a study of the cost of production in a western New York Baldwin orchard (trees 47 years old) showed an average yearly net profit per barrel, graded and ungraded stock, for the entire 20 years of $1.51. The net profit per acre for the same period was $120.71. The average yield per acre for the period was 118.35 bbls. and the average per tree 4.39 bbls. In concluding, the author points out that the results have been obtained under rather ideal conditions, with careful and economical management and with trees in the prime of their life.

Pear pollination, W. P. TUFTS and G. L. PHILP (*California Sta. Bul. 373* (*1923*), *pp. 3–36, figs. 11*).—Pollination studies carried on over a period of years with the Bartlett and other pears indicated that several factors are concerned in the successful setting of fruit. Although all the varieties studied produced abundant pollen, several were found to be self-sterile or partially so. Apparently all varieties were benefited by cross-pollination, larger crops being obtained and the fruit showing a tendency to cling better to the tree. Certain parental combinations were found to be more successful than others. The environment under which trees were grown exerted an influence on pollination, for example, the Bartlett pear, almost entirely self-sterile in the Sierra Nevada foothills, was able to produce fair crops of fruit in the interior valleys and along the coast. Winter Nelis proved to be the most satisfactory variety for pollinating Bartlett under the various environments studied. Bartlett itself was in all cases a capable pollinizer for other varieties.

That pear pollen is usually of strong viability was shown in tests repeated over a period of years, in which pollen of several varieties grown in a 12 per cent cane sugar solution gave negative results in only three of many tests.

Thinning investigations with the peach [trans. title], A. MANARESI and A. BRUNORI (*Staz. Sper. Agr. Ital., 56* (*1923*), *No. 7–9, pp. 401–414*).—Twenty-eight peach trees of the Amsden variety, 7, 4, and 3 years of age, blossoming March 18, 1921, and thinned on May 10 when the fruits averaged 4 gm., failed to yield sufficiently larger fruit or crops of fruit to justify the expense of thinning. The average weight of fruits harvested from the thinned trees was 56.4 gm. and that from the control trees 51.6 gm., while the total weight of fruit from the respective groups was practically identical. From the date of the first thinning, May 10 (4 of the 7-year-old trees were thinned a second time, June 4), to harvest there dropped from the thinned trees 38.9 per cent of immature fruit and from the control trees 39.3 per cent, leading the authors to suggest that June drop is a physiological phenomenon occurring quite independent of external treatments. In that unthinned trees were quite as vigorous at the end of the season as thinned trees, the authors failed to see any significant advantage from thinning under the conditions obtaining in the experiment.

The yield of budded cacao, S. C. HARLAND (*Trop. Agr.* [*Trinidad*], *1* (*1924*), *No. 5, pp. 66–69*).—Statistical analyses of records obtained by the Trinidad Department of Agriculture at River Estate upon the progeny of high-and-low-yielding cacao trees showed no correlation between the yield of a parent and the mean yield of its budded offspring. The lowest yielding progeny was derived from a high-yielding parent, and, reciprocally, the highest yielding progeny was obtained from a mediocre mother tree. That environment (soil conditions, etc.) was not the principal cause of the differences in yield was indicated by the fact that the yield of the lowest producing progeny was decidedly below the average of the nine progenies comprising itself and contiguous neighbors. The yield of the highest producing progeny, on the other hand, was much above that of the average of its immediate group.

Experiments in citrus fruit storage, D. B. ADAM (*Jour. Dept. Agr. Victoria, 21* (*1923*), *No. 5, pp. 307–317, figs. 2*).—As a result of investigations with the Washington Navel and Valencia oranges, the author concludes that 34° F. is the most favorable storage temperature, taking into consideration both keeping quality and freedom from spotting. Of two types of wrappers tested, plain tissue and waxed, the first gave the more satisfactory results. The " sweating " or drying of fruit for two weeks previous to storage gave positive results in the inhibition of diseases. The end of the sweating period was determined by the ease with which the stalk end or button could be detached from the orange. The Late Valencia kept better than the Washington Navel. It is thought that under favorable conditions oranges may be kept for three months without serious loss.

A biological study of the floral organs of the Elaeis palm [trans. title], H. Vanderyst (*Bul. Assoc. Planteurs Caoutchouc, 10 (1923), No. 11–12, pp. 198–203; 11 (1924), No. 1–3, pp. 3–8*).—In this article there are presented the detailed observations obtained in a technical study.

The improvement of palm oil production in French West Africa [trans. title], A. Houard (*Rev. Sci. [Paris], 62 (1924), No. 7, pp. 198–209, figs. 5*).—The present status of palm oil production is reviewed, and suggestions are made for improvement. It is recommended that trees propagated from high-yielding parents be set in regular plantation form and interplanted with cacao and coffee during the first 8 to 10 years. Improved processes of oil extraction should be utilized, whereby the present 8 to 10 per cent of oil obtained by natives might easily be increased to a possible 18 to 20 per cent.

Sugar producing palms, N. E. Fealy (*Facts About Sugar, 17 (1923), Nos. 3, pp. 58–61, figs. 2; 5, pp. 106–108, 109, figs. 3; 6, pp. 134–136, figs. 2; 7, pp. 155–157, 162, figs. 8; 8, pp. 184, 185, 187, figs. 3; 9, pp. 204, 205, 208, 209, figs. 4; 11, pp. 252, 253, 256–258, figs. 5*).—This extended discussion presents information concerning history, habits of growth, habitat, character of sugar produced, other products, etc.

Passion fruit cultivation in Victoria, J. Farrell (*Jour. Dept. Agr. Victoria, 20 (1922), No. 12, pp. 762–768, figs. 3; 21 (1923), Nos. 1, pp. 4–14, figs. 7; 3, pp. 163–170, figs. 6; 6, pp. 340–345, figs. 2; 7, pp. 405–412, figs. 6; 8, pp. 482–488, figs. 6; 10, pp. 603–611, figs. 5; 11, pp. 641–643*).—This is a general discussion presenting information regarding the history of the industry and its present status.

Seediness in pineapples, J. E. Higgins (*Philippine Agr., 12 (1924), No. 8, pp. 333–338*).—In considering possible causes of seediness in fruit of pineapple varieties normally seedless, the author suggests three possible explanations: (1) Bud mutation, (2) cross-pollination with inferior types, and (3) the accidental inclusion of seedlings in propagation material.

Influence of soil type on the yield and quality of pecans, J. J. Skinner (*Jour. Amer. Soc. Agron., 16 (1924), No. 1, pp. 51–57*).—Studies by the U. S. D. A. Bureau of Plant Industry upon the quantity and quality of pecans produced by a single variety growing in different types of sandy loam soil in a single or neighboring orchards indicated that in most cases the soil type exerted an effect upon the quantity and size of nuts and, in some cases, on the oil and protein content. At Putney, Ga., Schley trees produced larger nuts and were more productive on Orangeburg than on Norfolk soil, Alley trees gave larger yields and larger nuts on Greenville than on Norfork soil, and Stuart trees were more productive and yielded nuts with a slightly higher oil content on Orangeburg than on Ruston soil. At Cairo, Ga., Frotscher and Money Maker pecans were more productive and produced larger and better filled nuts of a higher oil and protein content on Greenville and Norfolk than on Susquehanna soil. Between the Greenville and Norfolk soil types there was practically no difference. At Robertsdale, Ala., Schley trees on Greenville sandy loam produced more, larger, and better filled nuts than did similar trees on Orangeburg soil. The data are presented partly in tabular form.

Flower growing, L. Barron et al. (*Garden City, N. Y.: Doubleday, Page & Co., 1924, pp. IX+255, pls. 8*).—This book, revised and adapted from a previously noted text by I. D. Bennett (E. S. R., 15, p. 258), presents general information on the culture, utilization, and characterisics of ornamental plants.

Better sweet peas, G. J. Ball (*Chicago: Florists' Pub. Co., pp. 63, figs. 4*).—This pamphlet contains general information on culture, breeding, etc.

Planning your garden, W. S. Rogers (*Garden City, N. Y.: Doubleday, Page & Co., 1923, pp. XI+301, pl. 1, figs. 105*).—Detailed suggestions are given for the artistic and useful development of small home grounds.

Design in the little garden, F. Steele (*Boston: Atlantic Monthly Press, 1924, pp. IX+124, pls. 9, figs. 3*).—Suggestions are given for the artistic development of moderate sized home grounds.

The complete home landscape, A. J. Jennings (*New York: A. T. De La Mare Co. Inc., 1923, pp. X+178, figs. 115*).—This handbook, prepared by the author in collaboration with L. H. Johnson, contains information concerning the principles and actual detailed practices of landscaping small home grounds. Lists are given of plant materials, arranged according to time of blooming, habit of growth, color of flowers, etc.

Landscape art past and present, H. H. McCormick (*New York and London: Charles Scribner's Sons, 1923, pp. XXIII+31, pls. 56*).—This elaborately illustrated book is a discussion of landscape gardening particularly as applied to the decoration of country estates.

FORESTRY.

[Annual reports of the Crown Land Department of the Province of New Brunswick for the years ended October 31, 1922 and 1923] (*New Brunswick Crown Land Dept. Ann. Rpts., 62 (1922), pp. 93, pls. 9, fig. 1; 63 (1923), pp. 101, pls. 7, fig. 1*).—Similar to earlier reports (E. S. R., 47, p. 41), these contain, in addition to the general administrative and fiscal statements, various subreports relating to game and fire protection, mining activities, forest surveys, insect control, etc.

Forest utilization in Europe, C. A. Schenck (*New York: News Print Serv. Bur., 1924, pp. 64, figs. 98*).—An illustrated pamphlet presenting information on the present status of forestry in Germany, Norway, Sweden, Czechoslovakia, Finland, and France.

List of common trees, shrubs, etc., in Siam, compiled by P. V. Pickarn (*Bangkok: Bangkok Times Press, 1923, pp. 4+278+III*).—This list, compiled by the conservator of forests and arranged alphabetically according to native names, comprises the more common wild and cultivated shrubs and trees of Siam.

Investigations concerning the seed years of Norway spruce in south and central Finland [trans. title], O. J. Lakari (*Commun. Inst. Quaest. Forest. Finland, No. 4 (1921), pp. [3]+1-54+1-4, pls. 9, figs. 22*).—Observations on the trunk and root development of Norway spruce felled in various localities showed that age determination is uncertain on account of adventitious roots and the lack of distinct annual rings. In general the rings showed less than the actual age. Productive or quite productive seed years were found to occur at intervals of from three to five years. The seed year for Scotch pine usually occurred one year earlier than that of the Norway spruce. A study of rainfall, summer temperature, and other factors possibly concerned in the occurrence of seed years indicated that dry and warm summers are often followed two years later by abundant seed years for Norway spruce and three years later for Scotch pine.

Bud expansion in the Norway spruce and its relation to late frost injury [trans. title], E. Münch (*Allg. Forst u. Jagd Ztg. [Frankfort on the*

Main], *99* (*1923*), *Nov.*, *pp. 241–265*).—An extended study of the factors concerned in the injury of Norway spruce buds from spring frosts revealed that under exactly the same environments all trees do not unfold their buds at the same time. Even on a single tree all buds do not open simultaneously, the terminal buds usually opening last. Buds on a sun-exposed branch were observed to open before those on shaded branches.

The variable behavior of individual trees is explained by the fact that most experimental Norway spruce stands in Germany are from seeds of mixed and unknown origin. Investigations carried on at various elevations where frost injury often occurs showed that spruce trees with late breaking buds make approximately double the height growth of early budding trees. With increasing age up to about 16 years buds opened later each year, quite independent of the size of the tree. On frosty sites bud opening was delayed and also under shelter or on high, exposed situations. Progeny from trees grown in frosty situations unfolded their buds on the average later than other trees. Trees from valleys opened their buds later than those from hilly localities. Spruce with green cones and their progeny unfolded their buds later than red coned trees. Late budding trees apparently endured more shade and grew more rapidly in shade than early budding trees.

The natural regeneration of Douglas fir in the Pacific Northwest, J. V. Hofmann (*U. S. Dept. Agr. Bul. 1200* (*1924*), *pp. 63*, *pls. 23*, *figs. 3*).—In this paper there are presented the results of a comprehensive study of the factors concerned in the establishment and growth of Douglas fir, a species which is highly esteemed in the Pacific Northwest because of its rapid growth, high quality of timber, and surprising ability to restock itself.

Douglas fir is a light-demanding species, making its maximum development in porous, well-drained soils along the coast where abundant moisture and moderate temperatures are the rule. Seed crops are generally produced every two or three years. Rodents of various kinds were found to be important agents in regeneration, seeds buried by them and never recovered constituting the basis of forest renewal subsequent to clear cutting or fires. Such buried seeds are capable of remaining dormant for long periods, until the oxygen supply, temperature, and other conditions are rendered favorable by the removal of the forest. Heating tests conducted in the laboratory and in the forest showed that Douglas-fir seeds can withstand 200° F. of dry heat for 10 hours, while moist heat at 160° is critical. Wind was found to play an insignificant rôle in the distribution of Douglas fir seed, such being carried rarely more than five chains from the parent tree.

As a result of studies of regeneration on burned-over areas, the author concludes that clear cutting, followed by careful slash burning, is the best method of logging. Later fires are disastrous, since they destroy all young growth and make restocking dependent upon trees of seed producing age, the absence of which means barren areas. Douglas fir, a light-requiring species, can not endure as an understory growth either to itself or other trees. Hence where fire or cutting are absent for several generations associated species, such as western hemlock and western red cedar, will often replace the Douglas fir.

Practical suggestions for handling Douglas fir lands following cutting or destructive fires are presented.

Thinning out of Scotch pine (Pinus silvestris L.) forests in the Netherlands [trans. title], H. van Vloten (*Meded. Rijksboschbouwproefsta. Wageningen, 1* (*1923*), *No. 2*, *pp. 54*, *figs. 21*).—Preliminary investigations carried on near Breda by the Netherlands State Forest Experiment Station led to the conclusion that the classification of trees followed by a systematic thinning is highly important in Scotch pine plantations because of the intolerance of this species to shading and its tendency to develop long, weak trunks under adverse environments. Thinning should be begun when the trees are quite young, before injury from crowding has started.

Rubber from buddings: Variability of rubber from individual buddings compared with rubber from seedlings [trans. title], O. de Vries (*Arch. Rubbercult. Nederland. Indië, 8 (1924), No. 3, pp. 111–129*).—A study of rubber obtained from ordinary plantations and from budded trees showed, in general, much greater variability in the product of the ordinary seedling groups, both as pertains to time of cure, viscosity, etc.

Experimental tapping on Hevea buddings, I [trans. title], C. Heusser (*Arch Rubbercult. Nederland. Indië, 8 (1924), No. 1, pp. 25–70, pl. 1, figs. 18; also Meded. Alg. Proefsta. Alg. Ver. Rubberplanters Oostkust-Sumatra, Rubber Ser., No. 40 (1924), pp. 46, pl. 1, figs. 18*).—Records of the yield of Hevea trees propagated from buds taken from high and low yielding parents show a distinct correlation between the production of parent and of progeny. The production of individuals of a clon was usually uniform and increased regularly with increase in trunk growth, bark thickness, and the number of latex vessels. Seedlings resulting from open pollination of productive mother trees were found to be variable in productivity, indicating that until controlled pollination or selfing is practiced budding is the better method of propagation. The bark thickness of budded trees at a height of 0.5 meter appeared to be slightly less than that of seedling trees. Budded trees resembled their parents in branch and crown. Budding is, however, considered as a temporary measure, to be replaced in the future by the breeding of high-producing, seed propagated stocks.

Estimating timber in the farm wood lot, M. E. Watson (*Maine Agr. Col. Ext. Bul. 148 (1924), pp. 16, figs. 2*).—Accompanying volume and log rule tables, simple, concise directions are presented for estimating the timber content of wood lots and forests.

Wood, A. te Wechel (*Het Hout. Zutphen: P. van Belkum, pp. [4]+272, fig. 192*).—An illustrated handbook designed for the forester, lumber merchant, and forestry teacher, presenting information on the anatomical and physical properties of various woods, lumbering operations, wood utilization, etc.

Forest products, 1922: Turpentine and rosin (*U. S. Bur. of the Census, 1924, pp. 6*).—This is the second of a series of annual reports on the naval-stores industry, compiled by the Bureau of the Census, Department of Commerce, in collaboration with the Bureau of Chemistry, U. S. D. A.

The manufacture of pulp and paper from Australian woods, L. R. Benjamin (*Aust. Inst. Sci. and Indus. Bul. 25 (1923), pp. XVI+92+[7], pls. 3, figs. 4*).—As a result of an investigation of the suitability of various Australian hardwoods for pulping, the author asserts that many of the species can be used for pulp-wood manufacture with slight modifications of the usual pulping processes.

DISEASES OF PLANTS.

Insect pests and fungous diseases of farm crops, A. Roebuck (*London: Benn Bros., Ltd., 1923, pp. 55, figs. 25*).—This booklet deals mainly in general rather than in specific terms with insect and plant disease injury as causes of loss in parts of Great Britain.

Plant protection.—I, Field crops. II, Fruit and wine crops. III, Truck and garden plants, G. Köck and L. Fulmek (*Pflanzenschutz.—I, Feldbau. II, Obst- und Weinbau. III, Gemüse- und Gartenbau. Vienna: Carl Gerold's Sohn, 1922, pts. 1, pp. VI+78+XX, figs. 87; 2, pp. VII+74+XLVIII, figs. 147; 3, pp. VII+88+XIX, figs. 87*).—These three parts deal in a general and systematic way with conditions and organisms affecting yield in plants as classified.

Fungi and plant disease, [I], II, H. A. DADE and R. H. BUNTING (*Jour. Gold Coast Agr. and Com. Soc., 1 (1921), No. 1, pp. 9-13; 1 (1922), No. 2, pp. 54-60*).—In the first of these two articles, by Dade, the purpose is to give a general account of the nature, causes, and prevention of fungus diseases. Methods of culture are briefly dealt with from the point of view of securing protection of the plants from disease.

The second paper, by Bunting, deals with specific diseases of economic plants in connection with practical control methods, the diseases including cacao black pod and the mealy pod disease.

[Plant diseases, South Africa] (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 1, p. 9*).—Evidence as to the infectious nature of sugar cane mosaic under local conditions is said to be cumulative, a case recently noted being cited in which Cheribon cane supposedly acted as carrier.

Peanut rosette is well known in Nigeria and exists also in Tanganyika Territory.

Tobacco wildfire made its appearance in a serious outbreak, affecting Turkish tobacco in the Stellenbosch area, this being the first record of the disease in the southwestern districts of the Cape Province. It is reported also as reappearing in the Rustenburg District. Good results in seed bed control are reported following weekly sprayings with Bordeaux mixture and lead arsenate.

Solanaceous wilt in the Philippine Islands, C. G. WELLES and E. F. ROLDAN (*Philippine Agr., 10 (1922), No. 8, pp. 393-403, figs. 6*).—A description is given of solanaceous wilt (*Bacterium solanacearum*) of tomato, tobacco, eggplant, and castor bean, which is said to cause the most serious losses in the Philippines to growers of solanaceous plants.

Eggplant appears to be somewhat resistant to attack, and can be grown successfully if planted in the rainy season so that maturity will be reached by December 1.

Tango (*Chrysanthemum coronarium*), a plant of Mediterranean origin, is said to be seriously attacked by an organism very similar to *B. solanacearum*, if not identical therewith.

Sulphur as a spray material, H. C. YOUNG (*Ohio Sta. Mo. Bul., 9 (1924), No. 1-2, pp. 9-11*).—Following the discovery that the toxic action of sulphur is due to pentasulphids, which are oxidation products (E. S. R., 50, p. 345), a study was made of lime sulphur and other sulphur compounds, and it was found that lime sulphur compound composed of 80 lbs. of sulphur and 36 lbs. of lime yielded the highest proportion of pentasulphids. Decreasing the amount of sulphur or increasing the lime gave larger amounts of other compounds.

When applied to plants, lime sulphur is said to have a caustic effect, and it destroys any spores with which it comes in contact. It turns white in a short time after being sprayed on the tree, leaving the sulphur in colloidal form. By gauging the early application of lime sulphur it is said to be possible to receive the benefit of its effectiveness due to its causticity at a time when the spores of the fungi are most abundant. In the case of apple scab, the author claims that by noting the time of spore discharge and making the application at that time, practically all the spores will be killed by the caustic action of the spray alone. Following this the sulphur still present will be effective against the more limited number of spores that follow. By taking note of spore discharge and making thorough application, apple scab can be almost entirely controlled by lime sulphur.

In connection with his investigations, the author made an attempt to prepare a sulphur spray material in which a very finely divided colloidal sulphur would be present. This was done by diluting 5 gal. of commercial lime sulphur with 10 gal. of water, after which the mixture was neutralized with acid until all the original yellow color of the lime sulphur had disappeared. This amount of material was then diluted to 100 gal. and used as a spray on apples for the control of scab, and on peaches and cherries. Almost complete control of scab was secured, and in no case was there any injury to the foliage.

Control of stinking smut or bunt of wheat with special reference to dust treatment, R. C. Thomas (*Ohio Sta. Mo. Bul., 9 (1924), No. 1–2, pp. 22–27, figs. 3*).—After describing stinking smut of wheat the author gives an account of tests made in 1922 and 1923 to demonstrate the value of copper dusts. Both spring and winter wheats were employed in the experiment, and while the check plats showed abundant infected materials no smutted heads were found in the formaldehyde plats, and the percentages of smutted heads were negligible where copper carbonate treatments were employed. Copper sulphate gave practically the same control as copper carbonate. Seed-O-San dust and Chlorophol reduced infection from 21 to 1 and 3 per cent, respectively. Nickel carbonate appeared to have a fungicidal value very similar to that of Seed-O-San. In practice the author recommends the use of 3 oz. of powder for each bushel of grain treated.

Experiments for the control of bunt, H. Ross (*Agr. Gaz. N. S. Wales, 34 (1923), No. 11, p. 780*).—"Fungicide experiments have been conducted to test the most reliable and economical method of treating seed wheat for the prevention of bunt. Three treatments—copper sulphate (1.5 per cent solution), copper carbonate, and a proprietary Burgundy mixture were tested against nontreated seed. In both sections copper carbonate gave the highest return per acre, and also proved its capability of destroying bunt spores."

Some aspects of the wheat rust problem, W. L. Waterhouse (*Agr. Gaz. N. S. Wales, 34 (1923), No. 6, pp. 381–387*).—This article briefly sets forth some of the known facts concerning the fungi which cause rust in wheat. The less important pair of these, yellow-stripe rust (*Puccinia glumarum*) and brown rust (*P. triticina*), are briefly noted. The rust causing great loss in certain years, black stem rust (*P. graminis*), is dealt with more in detail.

The studies which are in progress in Sydney, though as yet far from complete, indicate that certain wheats are resistant to every biologic rust strain thus far encountered in Australia. Commercial wheats like Federation have been crossed with them. There remains the task of selecting the right types of commercial value.

White stippling of alfalfa [trans. title], E. Hiltner (*Prakt. Bl. Bayer. Landesanst. Pflanzenbau u. Schutz, 1 (1923), No. 4, pp. 46–49, fig. 1*).—A white stippling of alfalfa leaves, described by L. Hiltner in 1908[1] and observed to recur in the succeeding years, has been studied and appears to be a phenomenon of potassium deficiency.

Recent studies on bean dry spot [trans. title], E. Schaffnit (*Beitr. Pflanzenzucht, No. 6 (1922), pp. 25–34*).—This contribution relates mainly to the relative varietal sensitivity of beans to a specific pathogen, in the present case *Colletotrichum* (*Gloeosporium*) *lindemuthianum*.

Diseases of the cotton plant, W. A. Birmingham and I. G. Hamilton (*Agr. Gaz. N. S. Wales, 34 (1923), Nos. 11, pp. 805–810, figs. 3; 12, pp. 877–886, figs. 9*).—Though knowledge regarding diseases of cotton in Australia is as yet limited, the gradually increasing importance of this crop has given rise to this short systematic and descriptive account, indicating as physiological diseases boll shedding, rust, club leaf or cyrtosis, and blue cotton; as bacterial diseases angular leaf spot (*Bacterium malvacearum*) and crown gall (*Pseudomonas tumefaciens*); as fungus diseases anthracnose (*Colletotrichum gossypii*), wilt (*Fusarium vasinfectum*), Texas root rot (*Ozonium omnivorum*), sore shin (*Corticium vagum solani*), internal boll disease, southern blight (*Sclerotium rolfsii*), leaf spot or blight (*Cercospora gossypina*), false or areolate mildew (*Ramularia areola*), rust (*Uredo gossypii*), mildew (*Oidium* sp.), Diplodia boll rot, Fusarium boll rot, leaf blight (*Alternaria* sp.), *Hymenochaetae noxia, Phyllosticta malkoffii*, and *Phoma roumii;* and a nematode (*Heterodera radicicola*).

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[1] Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 6 (1908), No. 10, p. 116.

Potato breeding with reference to disease research [trans. title], H. W. WOLLENWEBER (*Beitr. Pflanzenzucht, No. 6* (*1922*), *pp. 35–44*).—An outline review, with discussion, is given of potato breeding through the five stages indicated as passed during the three centuries since the introduction of this plant into Germany.

Potato disease control in Kansas, E. A. STODYK and L. E. MELCHERS (*Kansas Sta. Bul. 231* (*1924*), *pp. 3–45, figs. 16*).—According to the authors the more important diseases affecting potato tubers in Kansas are Rhizoctonia, blackleg, wilt, and scab. Tipburn or hopperburn and early blight are the only foliage diseases of importance. For the control of Rhizoctonia, blackleg, and scab, corrosive sublimate treatment is recommended. Experiments extending over five seasons are said to show that spraying the potato crop with Bordeaux mixture must be looked upon as an insurance against possible loss through epidemics of foliage diseases. Large increases in yield are not to be expected as a result of the application of the fungicide except during the seasons of epidemics of early blight, hopperburn, or tipburn.

The use of copper dusts, while promising, has not been tried over a sufficiently long time to warrant definite statements regarding their value. Certified seed of good yielding strains of potatoes is said to have distinct merit, as such seed outyields the average commercial seed and should carry less infection of diseases. Growers are advised to pay attention to the yielding capacity of the seed they buy. It is claimed that potato yields in the State have been materially increased when seed treatment, good yielding strains of seed, and the use of barnyard manure and green manure crops have been employed.

The relative responsibility of physical heat and microorganisms for the hot weather rotting of potatoes in western India, S. L. AJREKAR and J. D. RANADIVE (*Agr. Research Inst., Pusa, Bul. 148* (*1923*), *pp. 18, pls. 3*).—In the bulletin by Mann and others previously noted (E. S. R., 50, p. 247) it was stated that the form of potato rot characterized by a darkening of the tissues, pulp softening of the flesh, watery exudation, and foul odor, and constituting the most important cause of loss to storage potatoes in western India during the hot weather, during which it suddenly appears, causing wholesale destruction of tubers at temperatures at or above 100° F., is due to physical heat alone and not to any parasite. The name heat rot has, therefore, been given to this form of rotting. It is stated that the symptoms of heat rot are a variation, shown by the Italian white round variety of potatoes, of the symptom described as black heart of potato tubers by American workers. Heat rot can be prevented by lowering the temperature to 90°.

The striking differences between American and local descriptions, the constant occurrence of bacteria and often also of fungi, and the occurrence of this type of rotting occasionally at temperatures lower than 90° necessitated a closer inquiry into the nature of the rot. The bacteria concerned having been previously studied by Hutchinson and Joshi (E. S. R., 35, p. 349), the work presented here was limited to testing the action of three of the fungi found most commonly associated with potato rots in western India and of heat alone on potato tubers.

"Physical heat up to 42° C. (107.6° F.), by itself acting on potato tubers continuously for a period of at least nine days, causes no rotting in the absence of microorganisms. The symptoms described by Mann and Joshi and Nagpurkar as 'heat rot' occur only in the presence of microorganisms, especially bacteria, and may be produced at low temperatures (between 60° and 71° F.) if the appropriate microorganisms are present. Temperature, therefore, can not be the primary cause of the so-called 'heat rot.' The identification of the 'black heart' of potatoes described by American authors with the 'heat rot' is shown to be incorrect.

"Different varieties of potatoes differ considerably in susceptibility to 'black heart' on exposure to temperatures between 38° to 42° C. Some may remain normal even after nine days' exposure to 42° continuously.

"In view of microorganisms being the primarily responsible factor in the causation of 'heat rot,' reduction of the temperature of storage to 90° F. can not alone be relied on to insure freedom from this form of rotting, as previously believed. Apparently sound potato tubers may harbor the organisms concerned in the production of 'heat rot,' and these latter often escape surface sterilization of tubers with fungicides like copper sulphate and mercuric perchlorid. These fungicides, therefore, can not be entirely relied on to prevent rotting in storage."

Toledo cane, a mosaic-immune variety, R. R. Hind (*Sugar Cent. and Planters News, 4 (1923), No. 3, pp. 105–107, 110, figs. 4*).—In a planting of cane made in March, 1920, six stools attracted attention by their height, deep green color, erectness, and strength of stand. Repeated plantings have shown the stock to be prolifiic and immune to mosaic so far as yet observed.

Tobacco mosaic.—Some interesting experiments on a supposed disease in Turkish tobacco, W. H. Scherffius (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 1, pp. 33, 34, pls. 2*).—Tests made with Turkish tobacco previously supposed to be affected with mosaic seem to show that green splotches in the cured leaves, also lifeless dried leaves, were due to harvesting and otherwise handling the tobacco with gummy hands in the heat of the day, this tobacco being easily bruised when hot and wilted.

Spraying experiments with apples at Bathurst, G. P. Darnell-Smith (*Agr. Gaz. N. S. Wales, 34 (1923), No. 11, p. 824*).—It appears probable from the many experiments carried out during the previous three years that in the Bathurst district apple black spot and powdery mildew can be controlled with lime sulphur applied at the same time and together with the lead arsenate sprays for codling moth control.

Russeting of apples by Bordeaux mixture, G. P. Darnell-Smith (*Agr. Gaz. N. S. Wales, 34 (1923), No. 11, p. 828*).—A series of experiments, carried out at Glen Innes Experiment Farm with Bordeaux mixture at different strengths and with the components in varied proportions with a view to the avoidance of russeting of the fruit, indicated, so far as completed, that Bordeaux mixture at a strength of 3–4–100 should be used, and that, with varieties susceptible to spray injury (as Dunn and Jonathan), a considerably weaker solution of Bordeaux mixture is advisable.

Sprays for peach curl on trial at Yanco, W. W. Cooke (*Agr. Gaz. N. S. Wales, 34 (1923), No. 6, p. 452*).—Tabular showing is made of experiments for the control of peach leaf curl as carried out during 1922–23 at Yanco Experiment Farm on Elberta peaches.

Lime sulphur, either freshly made or stored for two months in wood, gave absolute control when used at full winter strength. Lime sulphur at full winter strength seemed to be as effective when applied August 10 as when applied July 12.

"Sour sap" of fruit trees, W. A. Birmingham (*Agr. Gaz. N. S. Wales, 34 (1923), No. 6, pp. 431–437, figs. 4*).—In 1918, a disease was reported as affecting peach (principally), plum, and apricot trees aged four years and upwards growing on soils ranging from pure sand to heavy clay. Apple trees were later found to be suffering from the same disease, which was pronounced identical with sour sap as known in America and New Zealand for many years. Lists of susceptible varieties are given.

No evidence was obtained as to any causal organism or to any soil condition. The trouble appears to be physiological, and probably associated with extreme weather conditions, two outbreaks following periods of excessive rainfall. Drainage may be partly responsible for the trouble.

Bunchy top in bananas, G. P. Darnell-Smith (*Agr. Gaz. N. S. Wales, 34 (1923), No. 12, p. 846*).—"This disease has had a disastrous effect upon many plantations in the Tweed district, and some plantations on the Richmond River have become affected. By the importation of healthy corms from healthy districts, it has been demonstrated that the disease is not due to a 'running out' of stock. Further analyses of soil from around healthy and unhealthy plants have been made, and further manurial trials have been carried out. From them it does not appear that the disease is due to the lack of any ordinary soil constituent. The suggestion that the disease is carried by aphids has been tested out, and while spraying plants with kerosene emulsion has kept these pests down, and has apparently to some extent minimized the amount of the disease, it has not yet brought it under control."

Banana stem and fruit rot, J. A. Agati (*Philippine Agr., 10 (1922), No. 9, pp. 411–422*).—It is said that throughout the American Tropics bananas ripen prematurely. This fact favors fruit rots, the most common and widespread of which is *Gloeosporium musarum*, the cause of destruction to whole plantations in some regions.

The object of the investigation here noted was to study the organism causing the fruit and stem rot of banana, its behavior in culture and nature, the extent of the damage done to the different banana varieties, and its mode of living and the method by which it is spread in nature as well as the manner of infection, with a view to the adoption of measures to check or reduce the disease. The work was conducted in the field and in the laboratory of the College of Agriculture from June, 1919, to March, 1921, and was applied to both native and foreign bananas planted side by side.

Fruit stored in damp places was easily infected, especially when the fruit was bruised on the peel and on the handle. *G. musarum* attacks about 30 different varieties of banana at the college and on outside plantations. The characteristic rot was reddish brown, turning black as it became old, and showing the presence of characteristic reddish-brown clusters of spores which later turned gray. The diseased fruit dried, hardened, and shriveled.

All the cultures used produced the disease through wounds. Mature as well as immature fruit was attacked, ripe fruit in storehouses being more susceptible to rotting than unripe fruit in the field. Immature fruit, especially on the bunch with inflorescences still attached, were found to take the disease more readily than the mature fruit from which the inflorescences had fallen. Sweet varieties easily succumbed to the disease. It is said that bunches having long stems with closely growing inflorescences were attacked under favorable conditions. Dampness appeared to favor the growth of the organisms. Morphological study of the cultures showed one general type of spores and mycelium, with a slight variation in the size and shape of the spores depending upon the age. There was a slight difference in the manner of growth on the different media, though the spores and mycelium produced in all cases were apparently identical.

It was observed, especially on outside plantations, that the fungus gained entrance through a wound on the rachis, which was due to the cutting off of the heart when gathered for food. In cases where the cut was made too close to the first finger, the fungus easily made its way to the bunch. Stems of diseased fruits were stunted and dried and the leaves were drooping and shriveled.

Recommendations are given as based upon the results and observations.

Mealy pod disease—a new foe to cocoa, R. H. Bunting (*Jour. Gold Coast Agr. and Com. Soc., 2 (1923), No. 2, pp. 92–94, pl. 1*).—The cacao mealy pod disease referred to on page 246 is said to be caused by a fungus (*Trachysphaera fructigena*) which can be found on broken cacao husks and on young and old cacao pods on most cacao farms. It acts as a wound parasite and has been found on unwounded healthy pods which had been detached from the tree. It is necessary to bury all cacao husks and diseased pods and to keep the trees in good condition.

Dead cocoa pods—a menace to the cocoa industry, R. H. Bunting (*Jour. Gold Coast Agr. and Com. Soc. (1922), No. 1, pp. 6–8, pls. 2*).—In many parts of the cacao area diseased pods may be found attached to the stems and branches of cacao trees at almost any time of the year. These diseased pods are frequently allowed to remain, constituting a danger to the future cocoa industry. A very large number of the pods have been most carefully examined, and 80 per cent were found to be attacked by the black pod fungus (*Phytophthora faberi*) which destroys the beans as well as the pods. This fungus disease develops rapidly under moist conditions, spreading from pod to pod by means of the spores. If conditions are suitable the fungus, which has developed from the diseased pod through the cushion into the wood of the stem, will continue to grow until the stem becomes cankered. Under very moist conditions the tree is killed. Removal and destruction or burial of the diseased pods are recommended.

Citrus canker eradication [South Africa] (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 1, p. 85*).—Inspection work during November, 1923, in one ward each of the Rustenburg, Pretoria, Waterberg, and Pietersburg Districts showed no fresh outbreaks or infections.

An uncommon condition of mandarin fruit, W. A. Birmingham (*Agr. Gaz. N. S. Wales, 34 (1923), No. 11, pp. 815–818, figs. 4*).—Unusual fruit conditions in Emperor mandarins, as here described, include disfiguring pimples or outgrowths of comparatively thin-walled cells, this being associated more or less, usually, with leaf frenching (light-colored areas on the leaves), and sometimes with depressed netted areas on malformed fruits, sufficient to render such fruit unsalable.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Some Colorado farm pests, with suggestions for control, W. L. Burnett (*Colo. Agr. Col. Circ. 39 (1923), pp. 24, figs. 11*).—This is a revision of Circular 35, issued in 1922. It discusses the more important rodent pests and means for their control through poisoning, fumigation, and trapping.

Mouse control in field and or[illegible] J. SILVER (*U. S. Dept. Agr., Farmers' Bul. 1397* (*1924*), *pp. II+14, figs. 13*).—This presentation of control measures for mice in fields and orchards supersedes Farmers' Bulletin 670, previously noted (E. S. R., 33, p. 250).

The birds of California, W. L. DAWSON (*San Diego, Calif.: South Moulton Co., 1923, vols. 1, pp. XVII+522, pls. 26, figs. 251; 2, pp. XI+523–1034, pls. 28, figs. 281; 3, pp. XIII+1035–1548, pls. 20, figs. 340; 4, pp. XIII+1549–2121, pls. 22, figs. 273*).—This work is said by the author to be a complete, scientific, and popular account of the 580 species and subspecies of birds found in the State of California. Analytical keys for the ready identification of birds of California are appended (pp. 2067–2100).

Insect food habits and vegetation, H. B. WEISS (*Ohio Jour. Sci., 24* (*1924*), *No. 2, pp. 100–106*).—In this paper the author calls attention to the types of insect food habits which appear to be associated with certain types of vegetation.

The specificity of food plants in the evolution of phytophagous insects, C. T. BRUES (*Amer. Nat., 58* (*1924*), *No. 655, pp. 127–144*).—This discussion includes a list of 32 references to the literature.

Fourteenth annual report of the State entomologist of Colorado for the year 1922, C. P. GILLETTE ET AL. (*Colo. State Ent. Circ. 38* (*1923*), *pp. 68, figs. 13.*)—This annual report on the occurrence of economic insects and means for their control, etc., includes notes on insect and mite pests (pp. 13–31); Dust *v.* Spray for Codling Moth Control, by J. H. Newton (pp. 31–43); Lime Sulphur Tests, by W. P. Yetter, jr. (pp. 45–47); Peach Tree Fumigation, by G. M. List and W. P. Yetter, jr. (pp. 47–49); Notes on Rodent Pests, by W. L. Burnett (pp. 49–57); and Apiary Inspection and Investigation, by N. Boggs (pp. 57–65).

The work on dust *v.* spray for codling moth control, many of the details of which are presented in tabular form, fails to indicate that there is any protection from the dust comparable with that from the liquid spray.

Fourteenth annual report of the State entomologist of South Dakota for the period ending June 30, 1923, H. C. SEVERIN (*S. Dak. State Ent. Ann. Rpt., 14* (*1923*), *pp. 42, figs. 15.*)—This report includes a discussion of the more important insect pests and plant diseases for the year 1922–23 (pp. 9–23), reports upon the Membracidae (pp. 27–33), the Phasmoidea (p. 34), and the Mantoidea (p. 35) of South Dakota, etc.

Report of the professor of entomology and zoology and provincial entomologist, W. H. BRITTAIN ET AL. (*Nova Scotia Sec. Agr. Ann. Rpt. 1923, pp. 48–61*).—This includes reports upon the progress of brown-tail moth work and upon extension work in the control of the cabbage maggot.

Three fruit tree insects and the sweet potato weevil [trans. title], M. S. ROIG, R. ARANGO, and I. MONTAÑO (*Cuba Sec. Agr., Com. y Trab., Ofic. Sanid. Veg. Bul. 4* (*1923*), *pp. 32, figs. 12.*)—This paper deals with the chalcidid *Bephrata cubensis*, which attacks Annona fruit; a weevil, *Pachnaeus* sp., which attacks citrus, Annona, etc.; a bostrichid beetle, *Apate francisca*, which bores in avocado, citrus, etc.; and the sweet potato weevil.

[**Insect pests of the farm**], F. R. PETHERBRIDGE (In *Fungoid and Insect Pests of the Farm. Cambridge, Eng.: Univ. Press, 1923, 2. ed., rev., pp. 84–174, figs. 29.*)—In the second part of this practical work (E. S. R., 35, p. 835), the author presents a brief summary of information on the more important insect pests of the farm in England.

A preliminary list of the pests of cultivated plants in Ceylon (*Ceylon Dept. Agr. Bul. 67* (*1923*), *pp. 68.*)—This is a host list of the important insect pests of cultivated plants in Ceylon.

Recent developments in peach pest investigations, O. I. Snapp (*Tenn. State Hort. Soc. [etc.] Proc., 18 (1923), pp. 35–41, figs. 5.*)—This account is based upon investigations of the U. S. D. A. Bureau of Entomology in Georgia.

Important pecan insects and their control, J. B. Gill (*U. S. Dept. Agr., Farmers' Bul. 1364 (1924), pp. II+49, figs. 61.*)—This is a revision of Farmers' Bulletin 843, previously noted (E. S. R., 38, p. 157).

The forest insects of central Europe: A textbook and handbook, II, K. Escherich (*Die Forstinsekten Mittelcuropas. Ein Lehr- und Handbuch. Berlin: Paul Parey, 1923, vol. 2, pp. XII+663, figs. 335*).—This second volume of the work previously noted (E. S. R., 32, p. 151), which is a new edition of the Judeich and Nitsche Lehrbuch der Mitteleuropäischen Forstinsektenkunde, deals in large part with the Orthoptera (pp. 3–26) and the Coleoptera (pp. 35–641). Bibliographies are included.

Comparison of three commercial brands of arsenate of lead (*Bur. Bio-Technol., Leeds, Bul. 11–12 (1923), pp. 97–104, figs. 3*).—In these studies it was found that, while the arsenic pentoxid content of each of the three brands was 30 per cent, there was a great difference in physical properties. There appeared to be some correlation between (1) density and fineness of division and (2) suspensibility and fineness in division, and there is supposed to be a similar correlation between fineness of division and spreading.

The use of emulsified oils as ovicides (*Bur. Bio-Technol., Leeds, Bul. 11–12 (1923), pp. 105–107*).—A brief discussion of the subject.

Egg killing washes, A. H. Lees (*Jour. Pomol. and Hort. Sci., 3 (1924), No. 4, pp. 174–178*).—Previously noted from another source (E. S. R., 50, p. 557).

Mormon cricket control, C. L. Corkins (*Colo. Agr. Col. Circ. 40 (1923), pp. 20, figs. 11*).—This is a discussion of *Anabrus simplex* Hald., which has been intermittently more or less of a menace in northwestern Colorado since the earliest settlement. A previous report of investigations of this pest by Gillette and Johnson has been noted (E. S. R., 17, p. 477).

Note on the infection of a mouse by means of bedbugs, Cimex hemiptera Fab., fed on the peripheral blood of a case of kala-azar, H. E. Shortt and C. S. Swaminath (*Indian Jour. Med. Research, 11 (1924), No. 3, pp. 965, 966*).—The authors find that *C. hemiptera* fed on a kala-azar case may contain, after the lapse of nine days, forms of *Herpetomonas donovani* which are capable of infecting white mice when inoculated intraperitoneally.

Notes on the Judas tree leafhopper, Erythroneura aclys McAtee, in New Jersey (Homop.), H. B. Weiss and E. West (*Ent. News, 35 (1924), No. 4, pp. 129–132*).—The authors present descriptions of the immature stages of a leafhopper which infests the red bud (*Cercis canadensis*).

Life history studies of Myzus persicae Sulzer, J. L. Horsfall (*Pennsylvania Sta. Bul. 185 (1924), pp. 16, figs. 3*).—The author first briefly considers the economic importance of the green peach or spinach aphid and its synonymy, gives a list of its food plants, technical descriptions of the spring migrants or winged viviparous females and of the apterous viviparous females, and an account of its life history. The life history studies, conducted by the author at the Bustleton Laboratory in 1920–1922, are then reported upon in detail, largely in chart and tabular form, the date of the first born of 20 generations being recorded.

It was found that in common with other aphids, *M. persicae* molts four times and passes through four nymphal stages before the adult stage is reached. The average duration of the first instar for 16 individuals was 2 days. The length of the second instar varied from 1 to 3 days with an average for 11 individuals of 2.1 days. The length of the third instar as determined for 16 aphids was longer than the first two instars and was also longer than the fourth. The third instar ranged from 1 to 3 days with an average of 2.3 days. The fourth instar had a range of 1 to 3 days, with an average of 2 days for the 11 aphids under observation. From 1 to 3 days may elapse from the time of the fourth molt to the birth of the first young. The average for 11 individuals was 1.6 days.

"In the generation experiments of 1920, females gave birth to the first young on the seventh and sixteenth day after their own birth. The average age for 11 mothers was 10.8 days. In 1921 the age at which reproduction began varied from 6 to 17 days, with an average of 10.5 days for 19 aphids observed. The age of 35 individuals in 1922 at beginning of reproduction ranged from 5 to 16 days, with an average of 9.3 days. The average of 65 mothers for the three seasons was 10.2 days. . . . The reproductive period varied from 4 to 33 days during 1920–21–22. The average for 25 females was 14.8 days. This period occupied the shortest space during June and extended over longer periods in July, September, and October. The total number of young born to a single female ranged from 4 to 60, with an average of 21.2 for 64 individuals under observation. The maximum number of young produced by one mother in a single day was 7. The average daily production for 54 individuals was 1.6. The length of life for 35 aphids varied from 12 to 50 days, with an average length of 23.5 days for the three seasons. These figures represent individuals which lived their entire life and died in the cages. . . .

"During the three seasons in which generation experiments were conducted at the Bustleton Laboratory, winged females of *M. persicae* appeared twice. . . . Oviparous females developed at the close of the generation experiments in 1920 and 1922. In both instances, it is interesting to note that this took place on one of the summer hosts, radish. In 1920 the same sexupara, which gave birth on October 11 to young which matured into oviparous females, later gave birth to young which matured into winged males. Oviposition by the oviparae in this experiment began 18 days after birth. A total of five eggs was deposited by 1 female on radish. In 1922, the progeny born on October 13 by a winged female matured into wingless oviparae. These mated 14 days after birth with winged males taken from chokecherry in the field."

The control of plant lice on vegetables, J. L. Horsfall (*Pennsylvania Sta. Bul. 186 (1924), pp. 16, figs. 6*).—The author reports upon spraying and dusting experiments conducted from 1920 to 1923 with the green peach or spinach aphid (*Myzus persicae* Sulz.) and the false cabbage aphid (*Aphis pseudobrassicae* Davis), which are serious pests in the sections of Pennsylvania where rutabagas and other cruciferous crops are grown. It was found that these species may be effectively controlled by spraying with nicotin sulphate, 40 per cent, diluted 1 to 500 with water, 5 lbs. of soap being added to each 100 gal. of solution. The Nixon type of boom, attached to any spray machine which will furnish at least 200 lbs. pressure, is said to be the most satisfactory for underspraying.

"Nicotin dusts will control these aphids, but they are more expensive than liquid sprays, unless the dusts are mixed by the user. The most satisfactory and economical results were obtained with 'free' nicotin dust containing 1.25 per cent actual nicotin and nicotin sulphate dust containing 2 per cent actual nicotin. The carrier recommended for use with nicotin sulphate is hydrated lime. Free nicotin will furnish equally good results in a hydrated lime carrier or in a dolomite lime mixture. An efficient type of dust mixer may be constructed by the grower from a small barrel and other materials on the farm. The dosage of dust, varying from 30 to 60 lbs. per acre, must be determined by size of the plants, nicotin content of the dust, and weather conditions. In either spraying or dusting operations, the nozzles or outlets must be set low enough to insure the insecticide reaching the lower surface of the leaves. The number of applications of either spray or dust must be determined by thoroughness of former treatments and recurrence of infestation."

Curly leaf transmission experiments, H. H. P. Severin (*Phytopathology, 14 (1924), No. 2, pp. 80–93, fig. 1*).—" Juice pressed from the leaves and roots of curly leaf beets when inoculated into the crown of healthy beets caused typical curly leaf symptom in 9 of 100 beets. The period from the date of inoculation until the earliest visible symptom of curly leaf developed varied from 12 to 39 days. Noninfective beet leafhoppers, when allowed to feed on the inoculated beets after curly leaf developed, transmitted the disease to healthy beets. The earliest symptom appeared in from 2 to 13 days. The causative agent of curly leaf is generally distributed in the foilage and beet root. Field and laboratory experiments demonstrate, beyond any question of doubt, that curly leaf is not transmited through the soil or from beat to beet.

" The shortest time required for the infective principle of curly leaf to travel through a beet petiole 7 in. long was ½ hour at a mean temperature of 103.5° F. Four days were required for the pathogenic factor to be transmitted from infective adults feeding on one of the first two outer leaves to noninfective males feeding on the inner or youngest leaf of a beet seedling as was proved by transferring the latter to a healthy beet. Two days were required for the inciting agent of curly leaf to be transmitted from infective leafhoppers feeding on the inner leaf to noninfective males on the outer leaf of a beet seedling, also from one of the first two outer leaves to the opposite outer leaf and from one cotyledon to the inner leaf and from one cotyledon to one of the first pair of outer leaves.

" Infective beet leafhoppers retained their infectivity during all of the nymphal stages, after each molt, and during the entire adult life. Noninfective beet leafhoppers which had been fasted and then the mouth parts contaminated with *Bacillus morulans* isolated from curly leaf beets or when allowed to puncture the bacteria into the tissue, rubbed on a portion of a beet leaf, failed to transmit the disease."

On the multiplicity of parasites of the grapevine pyralid, Oenophthira pilleriana Schiff. [trans. title], P. Voukassovitch (*Compt. Rend. Soc. Biol.* [*Paris*], *90 (1924), No. 6, pp. 402–405*).—The author presents a large list of parasites of *O. pilleriana* occurring in France.

Oriental peach moth dislikes some peaches and nectarines, M. A. Blake (*N. J. State Hort. Soc. News, 5 (1924), No. 1, pp. 73, 75*).—This is a brief report of investigations conducted at the New Jersey Experiment Stations, in which more than 125 types, varieties, and species of peach from all parts of the world have been grown. It has been found that, of species introduced from China, ***Prunus mira*** and ***P. kansuensis*** are only slightly injured by the oriental peach moth, and ***P. davidiana*** is, apparently, not palatable to the pest. Of several New Zealand varieties of nectarines introduced by the U. S. Department of Agriculture and which fruited during the summer, Sure Crop and Diamond Jubilee not only produced fruits of exceptional flavor but the several hundred specimens examined were all free from its attack.

Questions concerning the European corn borer, L. L. Huber and C. R. Neiswander (*Ohio Sta. Mo. Bul., 9 (1924), No. 1–2, pp. 2–8, figs. 11*).—This account furnishes practical information on the European corn borer in Ohio. No commercial losses have yet resulted, the average infestation in the infested territory being less than 1 per cent.

Two little known leaf miners of apple (Lepid.: Tineidae; Col.: Curculionidae), S. W. Frost (*Ent. News, 35 (1924), No. 4, pp. 132–134*).—These notes relate to the tineid *Lyonetia speculella* Clem. and the apple flea weevil, *Orchestes pallicornis* Say.

The natural breeding places of Anopheles mosquitoes in the vicinity of Mound, La., G. H. Bradley (*Amer. Jour. Trop. Med., 4 (1924), No. 2, pp. 199–223, figs. 9*).—This is a contribution from the U. S. D. A. Bureau of Entomology based upon larval collections made in selected areas in the vicinity of Mound.

The relation of domestic animals to Anopheles, M. A. Barber and T. B. Hayne (*Vet. Med., 19 (1924), No. 3, pp. 208–211*).—This has been previously noted from another source (E. S. R., 50, p. 559).

The effect of Chara robbinsii on mosquito larvae, M. A. Barber (*Pub. Health Rpts. [U. S.], 39 (1924), No. 13, pp. 611–615*).—The author finds that whatever larvicidal power may be possessed by some species of Chara, this property is not common to the whole genus. In investigations at Crowley, La., *C. robbinsii* Hals. showed no evidence of a harmful effect on larvae of Anopheles, and in fact proved an excellent culture medium for mosquito larvae when enough of it was placed in a receptacle so that a portion of it would rot.

Parasitic mites on mosquitoes, W. H. Dye (*Jour. Roy. Army Med. Corps, 42 (1924), No. 2, pp. 87–102, figs. 13*).—This is a report of observations of the infestation of mosquitoes by mites, particularly in the northern part of Nyasaland.

A new genus and species of Trypetidae infesting asparagus in South Africa, D. W. Coquillett (*Ent. Soc. Wash. Proc., 26 (1924), No. 3, pp. 64–66*).—The genus Zacerata is erected for a new trypetid, *Z. asparagi*, which attacks asparagus in South Africa.

Rearing records of Pollenia rudis Fab. (Dipt.: Muscidae), G. L. Garrison (*Ent. News, 35 (1924), No. 4, pp. 135–138*).—This is a contribution from the U. S. D. A. Bureau of Entomology based upon investigations conducted in the vicinity of Washington, D. C.

The genus Philornis; a bird-infesting group of Anthomyiidae, J. M. Aldrich (*Ann. Ent. Soc. Amer., 16 (1923), No. 4, pp. 304–309, fig. 1*).—A brief account of this group of parasitic Diptera.

The Colorado potato beetle (Leptinotarsa decemlineata) in British Columbia, J. W. Eastham (*Brit. Columbia Dept. Agr., Soil and Crop Circ. 2 [1923], pp. [4], fig. 1*).—It is stated that this pest has become firmly established in the East Kootenay region, to which district it is thought that it may be kept confined for some years and its spread north up the Columbia Valley and west into the dry belt rendered very slow. It is thought to have entered British Columbia from Montana, in the northern part of which it has become established.

The Mexican bean beetle in Ohio, A. E. Miller (*Ohio Sta. Mo. Bul., 9 (1924), No. 1–2, pp. 31, 32*).—The author here discusses the occurrence of the Mexican bean beetle in Ohio, showing that much of the State south of the latitude of north Columbus is probably infested with the pest. At no place has it caused an appreciable loss to the bean crop, but from the severity of injury in some localities, as Gallia, Pike, and Ross Counties, it may be expected to do so during 1924.

Cane borers in the Silay-Saravia Districts, A. W. Woods (*Sugar Cent. and Planters News, 4 (1923), No. 6, pp. 273–276, fig. 1*).—This is a report of observations by the author on the insect pests of sugar cane in Negros, P. I.

Treatment of seed corn with tar and Paris green as a protection from wireworms, C. R. WILLEY (*Va. State Crop Pest Comn. Quart. Bul. 5 (1923), No. 2, pp. 3*).—This is a report of tests undertaken to determine if the tar secured from gas plants in Virginia is suitable for treating corn and the effect on germination when corn is planted (1) at once and (2) several days after the treatment. The results indicate that the germination of the corn is not affected by the tar or the tar and raw linseed oil either with or without the Paris green, and that treating the seed three weeks before planting did not affect germination.

Responses of Bruchus to modified environments, J. K. BREITENBECHER (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *1923, III, pp. 32–35*).—This is a brief report of experiments conducted by the author in Oklahoma.

The apple flea-weevil, Orchestes pallicornis Say; order Coleoptera, family Curculionidae, J. S. HOUSER (*Ohio Sta. Bul. 372 (1923), pp. 397–434, figs. 16*).—The author reports upon work prepared for publication in cooperation with the Illinois Natural History Survey, as noted below.

The apple flea-weevil is a native insect generally distributed from Nova Scotia and Quebec to Oregon, Texas, and Virginia, but it has been found notably injurious only in southern and central Illinois and in a limited district in central Ohio. It feeds in small numbers, as beetle or larva, on a considerable variety of native trees and shrubs, but is definitely injurious only to the cultivated apple.

"It hatches from an egg laid in one of the thicker veins of the under side of the leaf and feeds on the leaf parenchyma, making a closed mine or burrow which is finally expanded at its outer end into a blotchlike blister within which the larva pupates. There is but one generation a year. The newly formed adults emerge from their mines in May and June, feed on the leaves for about a month, and then, in June and July, leave the tree to conceal themselves in what are to be their winter quarters, under grass, leaves, and rubbish on the ground. Here they remain until spring, leaving their shelter at about the time of the unfolding of the apple leaf, creeping up the trunks of the trees, or flying to the branches above, and beginning again to feed on the leaves, in which eggs are presently laid for the next generation. The egg period lasts about a week, that of the larva 17 days, and the pupal period 5 or 6 days. Injury is done by both the larval mines and the feeding punctures of the beetles, usually made in the under side of the leaf. The maximum effect in badly infested orchards is a destruction of the leafage sufficient to seriously weaken the tree and reduce it to worthlessness."

The information on control work, the accounts of which are quite similar, have been summarized as follows:

"The principal natural checks on the multiplication of the weevils are fungus and insect parasites, the former destroying the beetles by wholesale in wet summers and the latter killing the larvae. Experiments with means of control were made by banding the tree trunks with tanglefoot, spraying or dusting the leaves with poisons or with contact insecticides, burning the hibernating beetles in grass and rubbish under the trees, poisoning them there with sprays and poison dusts and by the use of poison baits, and cultivation of the orchard at a time and in a way to bury the hibernating beetles beyond resurrection or to keep the ground free from cover to which they might retreat in summer for concealment and hibernation.

"Thoroughly clean cultivation, carried close to the tree, was the most effective of these means, reducing formidable infestations to insignificance and improving the vigor and productiveness of the trees. Next to this was a spray of kerosene emulsion containing 7.5 per cent of kerosene, which, properly applied, killed practically all the beetles, as many in one instance as 9,000 to the tree. Burning in hibernation by a powerful kerosene blowtorch, of a kind used to melt asphalt in paving streets, was effective and useful when an orchard had been so cultivated as to concentrate the beetles under the trees, provided that the cover was of a kind to be burned completely at a reasonable expense for kerosene and labor. None of the various other means and methods with which experiments were made were sufficiently useful or promising to justify their recommendation."

The apple flea-weevil, Orchestes pallicornis Say (order Coleoptera; family Curculionidae), W. P. FLINT, S. C. CHANDLER, and P. A. GLENN (*Ill. Nat. Hist. Survey Bul., 15 (1924), Art. 1, pp.* [2]+37, *figs. 16*).—This is a report of investigations conducted for the most part independently by the Illinois National History Survey and the Ohio Experiment Station (see above), which have cooperated in the preparation of a report. The resulting papers are substantially equivalent, although not identical in all particulars, and are published as separate bulletins by two sets of authors.

Habits and control of the cotton boll weevil in North Carolina, R. W. LEIBY and J. A. HARRIS (*N. C. Dept. Agr. Bul., 1924, Mar., pp. 19, figs. 6*).—This is a progress report of studies at Aberdeen of the life history and control of the cotton boll weevil during the year 1923.

The authors find that "a single application of a sweetened poison mixture made when the squares begin to form kills some of the overwintering weevils when the mixture is applied in the bud of the plant by a mop at the rate of about 1 gal. of the mixture per acre. Apparently the killing of some of the weevils at this time will delay the arrival of the heavy infestation later in the season. A similar delay may be caused, however, by a very hot and dry July, which kills many of the larvae and the pupae of the first generation while these are developing in the fallen squares. One application of the home-mixed sweetened poison, consisting of 1 lb. of calcium arsenate, 1 gal. of molasses, and 1 gal. of water, made just when the squares begin to form, may, therefore, be found profitable. When four to seven applications of the mixture are mopped on the plants during the season (especially the fruiting part of the season) the cost of the additional applications is nearly as great or greater than the value of the amount of cotton gained by the treatments.

"Our single test with the Florida method was conducted on high-yielding cotton and showed a loss of 18 lbs. of seed cotton per acre when compared with an untreated plat located beside the Florida treated plat. This method apparently has possibilities for future development, perhaps when used in combination with applications of dry calcium arsenate late in the season. The Florida treatment also seemed to delay the arrival of heavy weevil infestation to the point where three applications of calcium arsenate dusted on the plants late in the season increased the yield over an untreated plat by 159 lbs. of seed cotton per acre. We can not recommend the Florida method for general adoption.

"In each of the four large scale, practical field tests to control the weevil by dusting four to seven times with calcium arsenate, beginning when 10 per cent of the squares are punctured, a highly profitable return was secured. This method is already well known and established. Our studies in each of the tests show that the infestation of weevils is kept down materially by the applications of the poison made at intervals of each four or five nights at the rate of 5 to 7 lbs. of the poison per acre. With good dusting machinery the dust poison can be driven into the squares, and dead weevils will be found in these squares rather commonly afterward."

Further experiments with the Florida method of boll weevil control, G. D. Smith (*Fla. State Plant Bd. Quart. Bul., 8 (1924), No. 2, pp. 29–72, figs. 9*).—This is a report of work carried on during 1923 in continuation of that reported the previous year (E. S. R., 48, p. 254). In the work conducted at Madison, Fla., during the summer the method was given a very severe test owing to the almost continuous daily rains from May 14 to August 7.

"In most cases where the Florida method was properly used a profitable crop of cotton was secured, whereas yields ranging from 27 to 150 lbs. per acre were the rule in nontreated fields. Weather conditions during the growing season of 1923 practically prohibited successful dusting of the cotton plants.

"A poisoned sirup mixture, made by mixing 2 lbs. of calcium arsenate in 0.5 gal. of water and then adding 1 gal. of sirup, when mopped in the buds of the cotton plants gave much better results than dusting. Sirup is not attractive to the weevil in the sense that weevils will search for it and congregate around it in numbers. However, weevils like to eat sirup and usually do so when they encounter it. Mortality records, secured under cage conditions and later verified by field experiments, show that after the squares are removed and the buds of the plants mopped with the poisoned sirup mixture mentioned above most of the adult weevils are killed within 24 hours. Powdered calcium arsenate dusted onto the plants by means of a dust gun required from 48 to 72 hours to give about the same result. Mopping the plants after the squares were removed, using 2 lbs. of poison, 1 gal. of sirup, and 0.5 gal. of water, was found to be cheaper than making one application of calcium arsenate dust, using a rotary fan type of dust gun, at the rate of about 5 lbs. per acre.

"The Florida method of weevil control can be effectively used under adverse weather conditions if the poison is applied in the form of a poisoned sirup mixture. The farmer can remove squares until about 4 o'clock in the afternoon, or until the day's rain has passed, and then mop the plants with the sirup mixture. If no rain falls before noon of the following day a second application of the poison is unnecessary. The cost of removing the squares varied from $0.53 to $1.88 an acre, depending on the spacing of the plants in the row and the number of squares on the plants at the time of stripping.

"A good grade of sirup is preferable to poor grades for weevil poisoning. Any kind of sirup can be used, but the better the grade of sirup the higher the percentage of control that will be secured. Less than 2 lbs. of calcium arsenate to the gallon of sirup is not recommended. There seems to be little reason for using more than 2 lbs. to the gallon. Using more than 0.5 gal. of water to the gallon of sirup dilutes the mixture to a point where very rapid evaporation takes place in the hot sunshine. It is desirable that the mixture retain its sirupy consistency as long as possible. Mopping with mops made by tying shucks or pieces of burlap on the end of a stick was found to be more successful than shaking the sirup mixture out of a bottle. By gently pressing the mop down into the bud of the plant there is practically no chance of the weevil missing the poisoned sirup mixture. On the other hand, if a drop o. two of the poisoned sirup mixture is shaken from a bottle onto the top leaves of the plant there is a chance that the weevil will not find the poisoned sirup until after it has been rendered harmless either by dew or rapid evaporation."

The apiary, W. S. Blair (*Canada Expt. Farms, Kentville (N. S.) Sta. Rpt. Supt. 1922, pp. 79–83*).—This is a report on production, condition of colonies, etc., at the Kentville Experimental Station.

Bee disease in Montana, O. A. Sippel (*Montana Sta. Circ. 120 (1923), pp. 14, figs. 5*).—Accounts are given of American foulbrood, European foulbrood, sacbrood, and disorders of adult bees, including dysentery, spring dwindling, and paralysis, with measures for their control.

The value of hive and wild bees in the production of fruit, C. H. Hooper (*[Wye, Eng.: Author], 1923, pp. 24, figs. 3*).—This is a review of the subject presented in an address by the author before the Ashford Branch of the Kent Beekeepers' Association in November, 1923.

Descriptions of three species of Tiphia parasitic on Popillia japonica (Hym.), S. A. Rohwer (*Ent. Soc. Wash. Proc., 26 (1924), No. 4, pp. 87–92*).—The author describes three species of Tiphia from Japan under the names *T. autumnalis* n. sp., *T. popilliavora* n. sp., and *T. vernalis* n. sp. He includes notes on their life history and habits by C. P. Clausen and J. L. King.

A further note on the carnivorous habits of Tachycines asynamorus (*Bur. Bio-Technol., Leeds, Bul. 11–12 (1923), pp. 108, 109*).—Observations here reported (E. S. R., 48, p. 853) indicate that when kept in captivity *T. asynamorus* is liable to develop cannibalistic habits when unable to secure suitable vegetation. "Further inquiries have shown that the insect is a vegetable feeder when given free access to greenhouses or a commercial nursery. It is still causing trouble in certain nurseries, and the method of hunting by night with lanterns has given good results in keeping the pest in check."

The discovery of Trypanosoma cruzi and of American trypanosomiasis [trans. title], C. Chagas (*Mem. Inst. Oswaldo Cruz, 15 (1922), No. 1, pp. 67–76; trans., pp. 2–11*).—This is a historic retrospect.

Herpetomonad flagellates in the latex of milkweed in Maryland, F. O. Holmes (*Phytophatology, 14 (1924), No. 3, pp. 146–151, figs. 10*).—The hemipteran *Oncopeltus fasciatus* (Dall.) is thought to transmit the flagellate *Herpetomonas elmassiani* (Migone) of milkweed from plant to plant.

FOODS—HUMAN NUTRITION.

The relation of moisture content and certain other factors to the popping of popcorn, F. C. Stewart (*New York State Sta. Bul. 505 (1923), pp. 5–70, pls. 4*).—In this investigation of factors influencing the popping quality of corn, the relation of moisture content was first studied by comparing the volume of the unpopped corn with the same corn popped under specified conditions.

New pop corn was placed in a Freas drying oven at 85° C. and samples were removed daily, analyzed for moisture content, and popped, after which the volume was compared with the volume of the sample before popping. The volume of the popped corn increased steadily for nine days, the moisture meantime decreasing. On the tenth day there was a slight decrease in volume. The moisture content at the time of largest volume was 13.5 per cent and the increase in volume over the original volume of the unpopped corn 28.1 per cent. In two further tests conducted along similar lines the largest volume of the popped corn was obtained when the corn had reached a moisture content of from 13 to 15 per cent.

A comparison was then made of the moisture content and popping quality of corn which had first been brought into good popping condition by artificial drying and then stored in muslin bags, part in the laboratory and part in an open shed protected from rain and snow. Popping tests were made every five days for three months, after which the bags were reversed and the popping tests continued. During the first three months the corn stored under open-air conditions maintained a moisture content of from 12 to 14 per cent and gave good yields of popped corn, while that stored in the laboratory lost steadily in moisture content and in volume when popped. When the bags were reversed the moisture content of the corn which had previously been kept indoors and its volume when popped increased. These results indicate that to keep popping corn in good condition it should be stored where it will have access to moist air or under conditions preventing the loss of moisture. During the dry weather of summer storage of the corn for a few days in the ice box is said to improve its quality. Storage in closed glass fruit jars is also recommended as a safe method of keeping corn in good popping condition.

As the result of several tests to determine the best method of restoring the popping quality of corn which has become too dry, the following directions are given: To 2 lbs. of the corn in a 2-qt. fruit jar are added from 2 to 5 tablespoonfuls of water. The jar is then sealed, shaken thoroughly, and allowed to stand two or three days before being popped.

Suggestions are included for determining for the variety of corn and type of popper used the optimum temperature conditions for popping, for washing pop corn, and for retaining the crispness of pop corn.

The popping of pop corn, J. D. Luckett (*New York State Sta. Bul. 505, pop. ed. (1924), pp. 13, figs. 3*).—A popular edition of the above bulletin.

First principles of the science of baking, W. Jago (*Chicago: Bakers' Helper Co., 1923, pp. 192, figs. 5*).—This volume, while intended for the baking technologist, contains many valuable suggestions for bread making in general.

Canned fruit, W. G. Savage and R. F. Hunwicke (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd., Spec. Rpt. 16 (1923), pp. IV+34*).—This report deals with an investigation of commercially canned fruit by methods similar to those employed in a previous investigation of canned meat and fish (E. S. R., 48, p. 754).

An examination was first made of 107 cans of different kinds of fruit which had been rejected by food inspectors. The rejected cans were submitted to physical, chemical, and bacteriological examination to determine whether the judgment in rejecting them had been correct. Of these cans 60 showed definite evidence of pressure in the can, with gas escape when opened. Of the 47 cans rejected for defects other than gas development, the judgment was found to be correct in 19 cases. In commenting on these results, it is stated that "the methods of examination have been developed as a purely rule-of-thumb technique, uncontrolled by scientfic studies of the contents. While they err on the side of undue severity, the slightest abnormality leading to rejection, they operate for the protection of the consumer."

A more detailed bacteriological examination was made of 165 samples of canned fruits consisting of 58 sound and the 107 rejected samples. Of the former, the contents of 77.6 per cent proved sterile, while of the rejected blown cans 38.3 and the rejected but not blown cans 55.3 per cent were sterile. Of the nonsterile but supposedly sound samples, the contents of only 1 can appeared to be abnormal. From this a yeast and spore-forming aerobe were isolated. From the other cans anaerobes were isolated from 4, spore-forming aerobes from 5, and both anaerobes and spore-forming aerobes from 3.

Of the many organisms isolated from the blown samples, it is considered that the anaerobes, spore-forming aerobes, and thermophiles may be disregarded, but yeasts, gas-producing, spore-forming aerobes, and the coccoidal bacilli are considered responsible for the spoilage. The distribution of these was as follows: Yeasts alone 2, coccoid bacilli (*Bacillus pleofructi*) 10, yeasts and coccoid bacilli 5, *B. coli* 2, and micrococci alone 12.

Of the rejected but not blown cans, no bacteria which could be associated with an unsound condition were found in 68 per cent, while numerous organisms were found in other samples.

It is concluded that the types of organisms associated with unsoundness are all of comparatively low resistance to heat with the exception of *B. botulinus*, which is considered to be of too rare an occurrence in canned fruit to be of any great significance.

Bacteriological examination of ground beef with reference to standard analysis.—I, Relation of bacterial count and aerobic species present to spoilage. II, Anaerobic species present in ground beef and their relation to spoilage, R. E. Hoffstadt (*Amer. Jour. Hyg., 4 (1924), No. 1, pp. 33–51*).—The chief purpose of the investigation reported in the two papers presented was to determine a standard for predicting the keeping qualities or the toxic effects of meat. The meat selected for the study was ground beef purchased in local markets of widely varying sanitary conditions, 22 samples being obtained at public markets and 27 from shops. Note was made of the sanitary condition of the market, the method of handling and wrapping meat, and the appearance of the meat as to quality, general cleanliness, and odor.

A comparative study was first made of the bacterial count, organoleptic test, and sanitary condition. There was a decided overlapping in range among these three tests, and no relation could be established between the initial bacterial count and the count as the meat aged. A detailed study of the aerobic organisms present showed no species or group which could be taken as a standard of meat analysis. Of the 645 aerobic organisms isolated, 328 were of undoubted environmental origin and 317 of fecal or doubtful origin. There was no relation between the percentage of proteolytic aerobes and the type of spoilage.

In the second paper are summarized the results of a detailed study of the anaerobes found in the meat. Of the 347 anaerobes isolated, 102 showed no proteolytic action on meat and probably belonged to the saccharolytic group, 115 showed strong proteolytic action, and 130 were weakly proteolytic in varying degrees. The presence of each of these groups was found to result in a definite type of spoilage, but there was no relation between the type of anaerobe present, the original organoleptic test, the sanitary condition, and the aerobic count. The author concludes that the presence of proteolytic anaerobes may serve as a criterion for predicting the keeping qualities of the meat.

Digestion experiments with the raw white of egg.—II, The digestibility of unbeaten in comparison with beaten whites, M. S. Rose and G. MacLeod (*Jour. Biol. Chem., 58 (1923), No. 2, pp. 369–371*).—The comparison of the relative digestibility of beaten and unbeaten raw egg whites noted in a previous study (E. S. R., 47, p. 166) has been repeated with 6 additional subjects.

The individual coefficients of digestibility for the beaten and unbeaten whites for the 6 subjects were, respectively, as follows: 92.7 and 86.2, 85.6 and 85.6, 79 and 80.9, 92.2 and 76.9, 93.4 and 88, and 86.4 and 90.3. The average values were 88.2 and 84.7 and the average coefficients of digestibility of the whole diet 87.6 and 85, respectively.

These results are thought to indicate that finely subdivided raw egg whites tend to be utilized somewhat more completely than those taken without any subdivision, although the difference is but slight.

On the estimation of metabolism from determinations of carbon dioxid production and on the estimation of external work from the respiratory metabolism, M. Greenwood and E. M. Newbold (*Jour. Hyg. [London], 21 (1923), No. 4, pp. 440–450*).—Some of the data reported in the monograph of Benedict and Cathcart (E. S. R., 31, p. 465) have been subjected to statistical analysis, with a view to determining how accurately the respiratory metabolism can be estimated from a knowledge of CO_2 output alone and how accurately external work can be estimated from respiratory metabolism and vice versa.

The conclusions drawn from the first part are that "as far as regards the determination of oxygen consumption or the respiratory quotient from CO_2, either by Waller's assumption of a constant respiratory quotient [E. S. R., 43, p. 463], or by the slightly more elastic method of treating rest and work observations separately and assuming a linear relation between CO_2 and either oxygen or the respiratory quotient, the results obtained are not suitable for very accurate measurement even in the case of a single subject working under homogeneous conditions, and would therefore be still more inaccurate if applied generally."

Similar conclusions are drawn from the second part of the investigation. "The practical conclusion seems, therefore, to be that when any experimental calibration of different forms of muscular work is based upon the confrontation of small samples of measurements upon different subjects, only the roughest results are attainable. We think it is certain that the difference in total energy transformation between, say, a needlewoman and a coal hewer, transscends even our very wide margins of variability, but it does not appear to be at all probable that either by Waller's technique, by the complete actual technique of indirect calorimetry, or by any at present available method the physiological calibration of industrial work can usefully be attempted on a grand scale."

A chart showing graphically the respiratory quotient and the percentage of calories furnished by protein, fat, and carbohydrate, E. F. Du Bois (*Soc. Expt. Biol. and Med. Proc., 21 (1923), No. 2, pp. 62, 63, fig. 1*).—In the chart, as reproduced on page 264, the base of the triangle represents the respiratory quotient. The ends represent, respectively, the theoretical point (R. Q.=0.707) at which 100 per cent of the calories is obtained from fat and the theoretical point (R. Q.=1) at which 100 per cent of the calories is obtained from carbohydrate. The top of the triangle represents the theoretical point (R. Q.=0.801) at which 100 per cent of the calories is obtained from protein. The percentage of calories furnished by protein is shown by the lines almost parallel to the base and that furnished by carbohydrate by the lines parallel to the left side of the triangle. The zone at the side and to the left of the triangle is that in which protein is partially converted into carbohydrate and that to the right of the triangle the zone in which carbohydrate is converted into fat.

Good proportions in the diet [trans. title], C. L. Hunt (*Bul. Soc. Sci. Hyg. Aliment., 11 (1923), No. 8, pp. 475-506, figs. 6*).—This is a free translation into French of Farmers' Bulletin 1313 (E. S. R., 49, p. 158).

Growth on diets high in carbohydrate and high in fat, A. H. Smith and E. Carey (*Jour. Biol. Chem., 58 (1923), No. 2, pp. 425-433, fig 1*).—The chief purpose of this investigation was to determine through feeding experiments with rats the relative efficiency of fats and carbohydrates as sources of energy when all of the other constituents of the diet were supplied in supposedly adequate amounts. The study also offered an opportunity to observe the adjustment of the growing animal to calorie intake on diets of widely different energy values.

The balanced control diet consisted of fat-free casein 18, starch 51, lard 23, cod liver oil 4, and salts 4 per cent; the high fat diet of casein 25, lard 65, cod liver oil 4, and salts 6 per cent; and the high carbohydrate diet of casein 14, starch 79, cod liver oil 3.8, and salts 3.2 per cent. The apportionment of total calories in protein, carbohydrate, and fat in the three diets was, respectively, as follows: Protein 13.8, carbohydrate 39.2, and fat 47 per cent; protein 13.8, carbohydrate 0, and fat 86.2 per cent; and protein 13.8, carbohydrate 77.8, and fat 8.4 per cent. In all the experiments vitamin B was provided by 30 mg. of Yeast Vitamin Harris fed apart from the ration.

The weights attained by the various groups at 80 days of age have been charted by sex and diet, with average normal weights for age in comparison. On the high carbohydrate diet the males had reached the normal weight and the females slightly more than normal weight. On the high fat diet both the males and females were below normal, the growth rate having begun to diminish in the males at about 50 days and in the females slightly later.

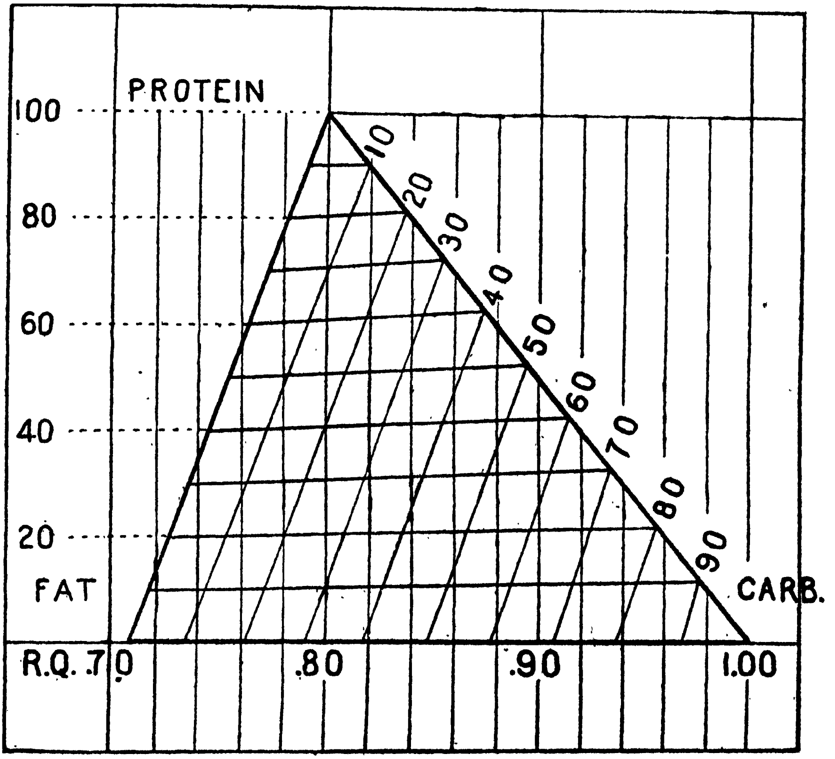

FIG. 1.—The respiratory quotient and the percentage of calories furnished by protein, fat, and carbohydrate.

The animals on the high fat diet were sleek and plump, while those on the high carbohydrate diet were larger and more rangy.

Calculations of the food intake on the various diets during the period in which normal growth was obtained were made separately for males and females, the former giving the number of calories consumed to gain 21 gm. between 40 and 50 days of age, and the latter to gain 19 gm. during the same period. The average total calories for the males were standard diet 307, high fat 305, and high carbohydrate 336, and for the females high fat 226 and high carbohydrate 273. These figures indicate a wasting of energy on the high carbohydrate diet, and this was found to be true at whatever age the comparison was made.

In discussing the significance of the results reported, it is suggested that the failure of the animals on the high fat diet to maintain their initial normal growth is due partly to the lack of desire for food. An attempt to increase the appetite of these animals by increasing the amount of yeast and consequently of vitamin B was without appreciable effect, but a decrease in the fat and an increase in the carbohydrate led to an immediate response. "The possibility of affecting appetite and thus growth by adjusting the fat and carbohydrate in an otherwise adequate diet is a new conception in nutrition and is worthy of more extensive experimental study. It is more than likely that, in spite of the highly emphasized potencies of newly discovered food factors, normal nutritive well-being will be secured only when the proper ratio, as well as the adequate absolute amounts of all of the recognized dietary principles, is maintained."

Animal calorimetry.—XXIII, The influence of the metabolism of the nucleic acids on heat production, M. Ringer and D. Rapport (*Jour. Biol. Chem., 58 (1923), No. 2, pp. 475–482*).—Continuing the series previously noted (E. S. R., 48, p. 161), a study was made of the effect of the ingestion of animal and plant nucleic acids on the basal metabolism of two dogs. The yeast nucleic acid used was Merck's commercial preparation, which contained 17 per cent of nitrogen and 8.2 per cent of phosphorus and was practically free of proteins. The animal nucleic acid was prepared from the thymus gland and contained 14.5 per cent of nitrogen, 8.1 per cent of phosphorus, and only a trace of protein. The administration of 20 gm. of each of these nucleic acids was without effect upon the heat production of the dogs. It is concluded that nucleic acids exert no specific dynamic effect.

Amino acid content of blood of infants and children, G. N. Hoeffel and M. E. Moriarty (*Amer. Jour. Diseases Children, 27 (1924), No. 1, pp. 64–66*).—Determinations by the Folin-Wu method are reported of the amino acid nitrogen in the blood of 50 children from the age of 9 days to 15 years and of 9 normal adults. Data are also reported on the nonprotein nitrogen, uric acid, and in a few cases the creatinin content of the blood.

The maximum, minimum, and average values for 20 infants 22 months and under were amino acid nitrogen 6.93, 4.41, and 5.57; nonprotein nitrogen 41.4, 15, and 26.6; and uric acid 6.76, 1.28, and 3.1 mg. per 100 cc. Corresponding values for 30 children from 2 to 15 years of age were amino acid nitrogen 7.14, 3.92, and 5.28; nonprotein nitrogen 49.5, 22.7, and 28.2; and uric acid 5.88, 2.56, and 3.8, respectively. The values for the adults were amino acid nitrogen 8.12, 6.36, and 7.04; nonprotein nitrogen 34.2, 27.6, and 30.5; uric acid 4.75, 3.28, and 4.05; and creatinin 1.53, 1.26, and 1.37, respectively.

The influence of diet on teeth and bones, G. Toverud (*Jour. Biol. Chem., 58 (1923), No. 2, pp. 583–600*).—This paper reports histological and chemical studies of the teeth of guinea pigs fed on a scorbutic diet and similar studies of the teeth of female rats on a low calcium diet, together with metabolism studies of these rats and analyses of their bones.

The teeth of the scorbutic guinea pigs showed marked degeneration of the pulp, with substitution of osteodentin for the normal orthodentin. As compared with the teeth of normal guinea pigs, chemical analyses showed a slight decrease in total ash and calcium and a marked increase in magnesium.

The female rats which were fed the low calcium diet failed in most cases to breed. Metabolism studies during the calcium-deficient period showed a low calcium retention and an abnormally high magnesium retention as compared with animals on the control diet. The blood calcium fell from 11 and 12 mg. per 100 cc. of serum in the normal rats to as low as 5 mg. in the rats on the calcium-deficient diet. The bones showed marked reduction in total ash, calcium, and phosphorus, and a possible increase in magnesium. Analyses of the molar teeth showed a reduction in the total ash, with a small decrease in calcium and phosphorus and a small increase in magnesium content. The front teeth showed a reduction in all of these values.

Value of cereals established by research, M. S. Fine (*Amer. Food Jour.*, *18 (1923), No. 11, pp. 511, 512, 543, 544, figs. 8*).—In the studies reported in this paper the vitamin B content of two cereal foods, Grape Nuts and Post's Bran Flakes, was determined by preventive and curative experiments with rats. In the former the cereal was fed at various levels in a ration consisting otherwise of casein, salt mixture, starch, butterfat, and lard, and in the latter it was fed as the sole source of vitamin B to rats in a state of nutritive decline on a diet deficient only in this vitamin.

In the experiments with Grape Nuts normal growth and reproduction, with rearing of the young, took place on rations containing 62 and 50 per cent of Grape Nuts. Good growth was also secured with 45 and 30 per cent. In the curative tests amounts as low as 1.5 gm. of Grape Nuts daily sufficed to restore the animals to good nutritive condition.

With bran flakes normal growth and reproduction took place when the flakes furnished 30 and 45 per cent of the ration, and from 1 to 2 gm. of the flakes sufficed as the sole source of vitamin B. In similar experiments in which a highly milled wheat product was used as the source of vitamin B as much as 4 gm. proved insufficient for growth.

The value of milk in the diet, W. Platt (*Amer. Food Jour.*, *19 (1924), No. 1, pp. 7, 8, 42*).—A general discussion.

Growth and reproduction of rats on whole milk as the sole diet, L. S Palmer and C. Kennedy (*Soc. Expt. Biol. and Med. Proc.*, *20 (1923), No. 8, pp. 506–508*).—A brief report is given of a limited study of the effect of an exclusive milk diet on growth and reproduction in rats.

On fresh, raw, liquid milk supplemented only by distilled water containing iodin, 3 male rats were raised from weaning to full size at maturity, but all failed to exhibit any mating instinct. In a second experiment, two colonies of 5 rats each grew normally for from 50 to 70 days on the exclusive milk diet, but all of the females remained barren. In a third experiment, 3 female rats which had been reared to partial maturity on a mixed diet and had given birth to one litter each, were placed in the colonies of the second experiment, since which time 1 of the rats has had two litters and the other one. Two of these litters died within a day or two. The mother of one of the other litters on being given about 0.5 gm. of dried yeast daily was able to nurse the 4 young, and the other was able to nurse 6 young successfully when her diet was supplemented by 0.2 gm. daily of yeast from which vitamin B had been removed by alcohol extraction.

In the fourth experiment 3 male and 4 female rats were fed an artificial dry milk containing the essential ingredients of cow's milk in the approximate proportions in which they are present in whole milk. Three of the females have had one litter each, and 2 of these have had a second litter. The first litters in all cases were normal until the fifteenth to twenty-first day, when spasms developed. In the second litter this was prevented by giving 0.2 gm. of dry whole yeast daily in one case and 0.2 gm. of dry alfalfa meal in the other case.

The degeneration of the testis of rats on a milk diet, H. A. Mattill and J. S. Carman (*Soc. Expt. Biol. and Med. Proc.*, *20 (1923), No. 7, p. 420*).—It is reported that the degeneration of the testis of rats on a diet in which the protein and vitamins are supplied by milk (E. S. R., 49, p. 663) has also been observed when such rations have been supplemented by nucleoprotein and by kidney and liver proteins to the extent of 2 per cent of the diet. Since these rations furnish an adequate amount of vitamin B, it is concluded that "the lack of some other substance than vitamin B, and as yet unrecognized, may be solely or jointly concerned in the disappearance of the reproductive function."

Fat-soluble vitamins.—XVI, Stability of the antirachitic vitamin to saponification, H. Steenbock, J. H. Jones, and E. B. Hart (*Jour. Biol. Chem., 58 (1923), No. 2, pp. 383–393, figs. 6*).—In this continuation of the series of studies previously noted (E. S. R., 51, p. 68) the ether extract of cod liver oil subjected to drastic saponification has been shown to be as effective as untreated oil as a source of antirachitic vitamin. Dogs were used as experimental animals, and the tests included the effect of the untreated and treated oil on growth, calcification of the bones, and maintenance of normal calcium and phosphorus content of the blood.

Antirachitic effect of cod liver oil fed during the period of pregnancy or lactation, A. F. Hess and M. Weinstock (*Amer. Jour. Diseases Children, 27 (1924), No. 1, pp. 1–5*).—Cod liver oil when fed to female rats during the last half of pregnancy or during the lactation period was found to have no protective influence on the young when the latter were placed on rickets-producing diets subsequent to weaning. When administered directly to the young during the lactation period, the oil served to protect against the development of rickets at a later period. This is thought to indicate that the active principle is not transferred in appreciable amounts to the milk of lactating animals, but is capable of being stored by the young when fed directly. It is noted that in this connection the factor of growth must be taken into consideration. Evidence is advanced that storage of antirachitic vitamin is not so great in a rapidly growing animal as in one in which the growth processes are not so marked.

Blindness and other diseases in children arising from deficient nutrition (lack of fat-soluble A factor), C. E. Bloch (*Amer. Jour. Diseases Children, 27 (1924), No. 2, pp. 139–148, figs. 8*).—In this further discussion of the occurrence of xerophthalmia among the children of Denmark, as previously noted in a paper by Blegvad (E. S. R., 50, p. 772) and in earlier papers by the author (E. S. R., 45, p. 668), attention is called to the fact that the children developing xerophthalmia are often attacked by some infectious disease, which usually takes the form of simple catarrhal infection of the mucous membrane, particularly of the respiratory organs and the middle ear, but may consist of *Bacillus coli* infection of the urinary tract and infectious dermatitis. It is said that these infections are very persistent and often fatal. There have been few cases of rickets in connection with xerophthalmia. The greater incidence in the spring is attributed rather to the effects of seasonal growth than to a difference in the vitamin A content of the milk.

Blindness and other diseases in children arising in consequence of deficient nutrition (lack of fat-soluble A factor), C. E. Bloch (*Jour. Dairy Sci., 7 (1924), No. 1, pp. 1–10, figs. 3*).—This is a general discussion of the author's investigations on xerophthalmia among the children of Denmark, as noted above.

Vitamin B as a factor in nutrition, G. R. Cowgill (*Nation's Health, 5 (1923), No. 8, pp. 509, 510, 561*).—In this discussion of the occurrence, properties, and functions of vitamin B special emphasis is placed upon its effect upon the appetite. It is pointed out that most of the common foods which are included in the menus for the sick and convalescent are low in vitamin B, and that greater care should be taken by physicians and dietitians to supply a sufficiency of vitamin B in such menus on account of its effect upon the appetite.

The effect of diet on the content of vitamin B in the liver, T. B. Osborne and L. B. Mendel (*Jour. Biol. Chem., 58 (1923), No. 2, pp. 363–367, fig. 1*).—The authors, with the cooperation of H. C. Cannon, have compared as sources of vitamin B the dried liver tissue of rats which had lost weight on a diet lacking in vitamin B with that of other rats which had been on a mixed diet. The tests were conducted on young rats which had been brought to a state of nutritive decline on a diet lacking vitamin B. The dried liver tissue was fed apart from the basal ration in amounts of from 50 to 200 mg. daily.

In the case of the liver from the well-fed animals a favorable response was obtained even with the smallest amount fed, while with 100 mg. growth was nearly normal, and with from 150 to 200 mg. fully normal. As compared with yeast, the liver in this case was almost as good a source of vitamin B. On the livers of rats on the vitamin B-free ration none made adequate gains, and nearly all declined rapidly and died. "From the clear-cut outcome of this study the conclusion seems inevitable that when an adequate supply of vitamin B is lacking in the diet the store of this factor in the liver tissue, where it is ordinarily found in abundance, becomes largely depleted."

The presence of vitamin B in frozen flesh food, A. M. Wright (*Jour. Soc. Chem. Indus., 42 (1923), No. 41, pp. 403T, 404T; also in New Zeal. Jour. Sci. and Technol., 6 (1923), No. 3, pp. 129–133*).—The investigation reported in this paper was concerned chiefly with a comparison of the vitamin B content of fresh and cold storage meat, but incidentally furnishes evidence of the need of chickens for both vitamins A and B.

White Leghorn cockerels from two to three weeks old at the beginning of the experiment were used as experimental animals. The control group received a ration composed of purified casein 2.7 gm., starch 8.25, butterfat and lard 3, and Osborne and Mendel's salt mixture 0.75 gm. daily. When the equivalent of 0.4 gm. of dried yeast and the juice of swede turnips were given in addition to the basal ration, there was continuous growth and increase of weight during the 60 days of the experiment. When the yeast alone was omitted, the chickens did not grow and died in about 16 days, but with no symptoms of polyneuritis. When for the lard and butterfat there was substituted mutton fat which had been heated for six hours in the air, the animals ceased to grow and died in from 28 to 35 days, but maintained their appetite until death. When both vitamins A and B were removed from the ration, the animals lost appetite after about 5 days, lost in weight rapidly, and died in about 10 days.

In the main experiment the meat to be tested was substituted for the casein and a portion of the meat used in the diets of the control animals. The proportions of the various constituents were adjusted as in the basal ration. No yeast was given. The meats used were fresh lamb, three years' cold storage lamb, fresh mutton, fresh beef, two years' cold storage beef, and nine years' cold storage pork. In all the experiments except those in which pork was used, the chickens either lost weight or remained stationary in weight for about 14 days and then showed steady and continued growth. In the pork experiment, growth was continuous from the start. No difference was noted between the growth and condition of the groups on the fresh and on the cold storage meat.

It is concluded that cold storage up to nine years at temperatures ranging from 2 to 15° F. does not destroy the vitamin B of the meats.

The presence of vitamin A in frozen pork, A. M. Wright (*New Zeal. Jour. Sci. and Technol., 6 (1923), No. 3, pp. 133, 134; also in Jour. Soc. Chem.*

Indus., *42 (1923)*, *No. 52*, *p. 509T*).—In experiments similar to the above, pork was tested for its content of vitamin A by comparing the growth of white Leghorn cockerels on rations consisting of pork containing 25 per cent of fat, starch, salt mixture, and the juice of swede turnips. In control experiments, butterfat was also given as a source of vitamin A. The growth of the chickens on the diet furnishing pork as the sole source of vitamin A was as good as that on animals on the synthetic diet described in the previous paper, and practically as good as that on the diets supplemented with butterfat. It is concluded that pork even after nine years cold storage contains an appreciable amount of vitamin A.

A preliminary note on the destruction of vitamin B by age, G. M. FINDLAY (*Biochem. Jour.*, *17* (*1923*), *No. 6*, *pp. 887–890*, *figs. 5*).—Six varieties of lentils, which were brought to England from India 38 years ago and had been stored in canvas bags in a dry cupboard since that time, were tested for vitamin B by the usual feeding experiments with young rats. The technique followed was similar to that of Ghose in a study of the vitamin B content of the same varieties of lentils, presumably fresh (E. S. R., 47, p. 661). The only exception (but one which should be taken into consideration in the interpretation of the results) was that the feces of the rats were removed twice daily, following the precautions recommended by Steenbock, Sell, and Nelson (E. S. R., 49, p. 665).

In all cases satisfactory growth was obtained with 3 gm. of the lentils as the sole source of vitamin B, as compared with the 1 gm. reported by Ghose to be sufficient. It is of significance that these lentils, which had completely lost their power of germination, still retained an appreciable amount of vitamin B.

The alleged specific color reaction for the antiscorbutic factor, H. D. KAY and S. S. ZILVA (*Biochem. Jour.*, *17* (*1923*), *No. 6*, *pp. 872–874*).—As the result of the application of the Bezssonoff color test for vitamin C (E. S. R., 46, p. 668) to a large number of substances which were tested simultaneously on guinea pigs, the authors have come to the conclusion that "although there is a certain association between this color reaction and the antiscorbutic activity of some substances, the relationship does not hold true in all cases. We have been able to find, on the one hand, some antiscorbutically active substances which fail to give the color reaction, and on the other hand, inactive substances which produce the coloration in question."

Studies on the vitamin problem.—II, Investigations on the influence of vitamins and starvation on the metabolism, weight, and length of life of white mice fed on a vitamin-free diet [trans. title], F. GROEBBELS (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, *131* (*1923*), *No. 4–6*, *pp. 214–240*, *figs. 15*).—This investigation has been essentially noted from a preliminary report (E. S. R., 49, p. 64).

Pathogenesis of deficiency disease, XII, XIII, R. MCCARRISON (*Indian Jour. Med. Research*, *10* (*1923*), *No. 4*, *pp. 861–907*, *figs. 21*).—In continuation of the investigation previously noted (E. S. R., 50, p. 865), two papers are presented.

XII. *Concerning the function of the adrenal gland and its relation to concentration of hydrogen ions* (pp. 861–899).—This has been essentially noted from another source (E. S. R., 49, p. 561).

XIII. *Effects of heat, cold, serum, and sunlight on the action of epinephrin and adrenalin hydrochlorid* (pp. 900–907).—In this further study of the function of the adrenal glands the same methods were used as in the above study, i. e., epinephrin and adrenalin hydrochlorid were subjected to the effect of various factors and tested for activity on the enucleated eyes of toads.

Incubator temperature was found to inhibit the action of epinephrin and ice-box temperature to strengthen it. Serum alone inhibited the action of adrenalin hydrochlorid, but serum containing the enucleated eyes did not. Exposure of the serum containing adrenalin hydrochlorid to the rays of the sun for periods up to two hours had no effect on the subsequent action of the adrenalin.

These results are thought to be concerned with the activity of the oxidative processes in the body. "There is reason to believe that the adrenal glands can adapt themselves to changes in oxidation and reaction by a corresponding regulation of their output of epinephrin. But even if an output of epinephrin proportionate to the varying needs of the body be not admitted, it is evident that the effect on the animal body of a constant output of epinephrin will vary with the oxidative processes and with the blood and tissue reaction."

Note on the alleged growth-promoting effect of air irradiated with the quartz mercury vapor lamp, T. A. Webster and L. Hill (*Jour. Physiol., 57 (1923), No. 6, pp. LXXVIII-LXXX*).—The authors report that they have repeated and extended the work of Hume and Smith on the effect of irradiated air on the growth of rats (E. S. R., 50, p. 265), but have been unable to substantiate their conclusions that irradiated air has a growth-promoting effect. Negative results were also obtained with ozone, dilute NO_2 gas, air in glass jars that had been exposed to an X-ray tube and was presumably ionized, and cigarette smoke, the latter being taken as a more or less mild irritant and because of the possibility of its containing some ionized air. Negative results were also obtained in attempts to prevent rickets in young rats fed on a deficient diet by exposing them daily for 30 minutes to the air led from the inclosure of a mercury vapor lamp into the box in which they were kept.

A study of the treatment and prevention of pellagra, J. Goldberger and W. F. Tanner (*Pub. Health Rpts. [U. S.], 39 (1924), No. 3, pp. 87-107*).—Continuing the study at the Georgia State Sanitarium of dietary measures for the treatment and prevention of pellagra (E. S. R., 50, p. 669), the authors have tested the value of fresh beef, gelatin, buttermilk, butter, and a cod liver oil in the prevention and cure of the disease.

Eight cases of well-marked though not severe pellagra showed marked improvement following the addition to the diet of 7 oz. (about 200 gm.) daily of fresh beef. This treatment in 4 cases followed unsuccessful treatment with gelatin. The ordinary diet of the sanitarium, on which many contracted pellagra, was supplemented in 29 cases by 40 fluid oz. (1,200 gm.) daily of buttermilk. None of the patients receiving buttermilk showed any evidence of pellagra during the period of observation. It is estimated that from 4 to 4.5 oz. of fresh beef and not over 40 fluid oz. of buttermilk daily will suffice to prevent pellagra in all but exceptional cases.

Fresh butter in quantities averaging from 125 to 135 gm. daily and cod liver oil in quantities averaging upward of 2 gm. per kilogram of body weight failed to prevent pellagra in the several cases in which they were tried.

These results are thought to afford further evidence that the primary dietary factor in pellagra is a deficiency in some amino acid, or in some as yet unrecognized dietary complex, or in some combination of the two.

Composition of two definite diets for the study of scurvy and of avian polyneuritis [trans. title], L. Randoin (*Bul. Soc. Sci. Hyg. Aliment., 11 (1923), No. 8, pp. 453-467, figs. 4*).—Detailed descriptions are given of the synthetic diets employed by Lopez-Lomba and Randoin in the experimental study of vitamins B and C (E. S. R., 50, p. 62, 166).

Comparative study of the blood sugar concentration in the liver vein, the leg artery, and the leg vein during insulin action, C. F. and G. T. CORI and H. L. GOLTZ (*Jour. Pharmacol. and Expt. Ther., 22 (1923), No. 5, pp. 355–373*).—To throw some light on the mechanism by which insulin lowers blood sugar, simultaneous analyses were made of the blood of the liver vein, the femoral artery, and the femoral vein of rabbits following injection of insulin. These showed a diminished output of sugar by the liver into the blood stream and a larger intake of sugar than normal by the muscle from the blood stream. It is concluded that insulin may cause a fall of blood sugar by its action on the liver, resulting in a diminished output; or on the muscle, resulting in an increased intake; or by combined action on both the liver and the muscle.

On the effect of insulin on blood phosphate, V. B. WIGGLESWORTH, C. E. WOODROW, W. SMITH, and L. B. WINTER (*Jour. Physiol., 57 (1923), No. 6, pp. 447–449*).—The injection of insulin into normal rabbits was found to cause a rapid fall in the inorganic phosphorus of the blood, the low level persisting for several hours after the administration of glucose and recovery from convulsions. The content of acid-soluble phosphorus was not changed appreciably.

In discussing the probable cause of the lowering of the blood phosphorus, the possibility is suggested that phosphorus may play a part in the conversion of glycogen into some sugar complex which is resistant to acid hydrolysis.

Insulin in the severer forms of diabetes, with report of cases, L. F. FRISSELL and J. HAJEK (*Arch. Int. Med., 33 (1924), No. 2, pp. 230–250, figs. 14*).—In these detailed reports of the use of insulin in the treatment of 13 cases of severe diabetes, considerable discussion is given of the dietary measures employed. In all cases the amount of glucose available to the body was calculated by adding to the carbohydrates of the diet the amount of glucose theoretically available from the protein (58 per cent), calculated not from the protein of the diet but from the urinary nitrogen as representing the total amount of protein actually metabolized in the 24-hour period. Ten per cent of the fat was also calculated as available for the formation of glucose.

It is emphasized in conclusion that the diet must be even more carefully maintained when insulin is used than in cases untreated by insulin, and that education of the patient in the calculation of his diet and the simple analysis of his urine must be insisted on.

Growth of Clostridium botulinum in fermented vegetables, F. M. BACHMANN (*Jour. Infect. Diseases, 34 (1924), No. 2, pp. 129–131*).—To determine whether *C. botulinum* is capable of growing and producing toxin in fermenting vegetables, fresh cabbage and green beans were ground in a meat grinder or cut in fine pieces and then inoculated with a meat culture of *C. botulinum* and left for two months tightly packed in test tubes. At the end of the period guinea pigs were forcibly fed liquid from uninoculated and inoculated tubes.

There was no evidence of toxicity in any of the samples of cabbage, but the three animals receiving the juice from the inoculated beans died in 1, 2, and 4 days, depending upon the dilution of the inoculation. Some of the material which proved most highly toxic was heated at 100° C. for 10 minutes and tested as before. This proved to be no longer toxic.

In discussing the dfference in results between the cabbage and beans, it is pointed out that the beans contained considerably more protein than the cabbage, and that it is possible that the growth of botulinus toxin was favored by the amount of protein present. The H-ion concentration of the juice of the two vegetables was about the same.

The Aberdeen epidemic of milk-borne bacillary dysentery, March to May, 1919, J. P. KINLOCH (*Jour. Hyg. [London], 21 (1923), No. 4, pp. 451–459*).—A description is given of an epidemic of diarrhea or gastro-enteritis occurring in Aberdeen, Scotland, in 1919. This epidemic, which involved over 1,000 cases with 72 deaths, was definitely traced to the infection of milk with dysentery bacilli of the Flexner type. After the serological proof of the nature of the disease had been obtained, the remaining cases were given intravenous injections of polyvalent antidysenteric serum, with the result that there were no more fatalities.

Epidemic enteritis in Aberdeen due to food infections, J. S. ANDERSON, J. P. KINLOCH, and J. SMITH (*Jour. Hyg. [London], 22 (1923), No. 1, pp. 89–99*).—Three outbreaks of enteritis occurring in Aberdeen since the one noted above are discussed briefly. One was traced to meat, one to milk, and one was of undetermined origin. In spite of the fact that clinical material was available and that the symptoms resembled those of Gaertner infections or of infections of bacillary dysentery, convincing bacteriological proof was not obtained as to the cause of the outbreak.

Studies on the paratyphoid-enteritidis group.—VIII, An epidemic of food infection due to a paratyphoid bacillus of rodent origin, O. SALTHE and C. KRUMWIEDE (*Amer. Jour. Hyg., 4 (1924), No. 1, pp. 23–32*).—This paper reports a study of an outbreak of food poisoning occurring in New York City in April, 1923, involving 59 cases with no fatalities. The incriminating food proved to be the cream filling of eclairs and crumb cakes, from which *Bacillus pestis caviae* (*B. typhi murium*—"mutton" type) of rodent origin was isolated.

In discussing the relation of this microorganism to food infection, the authors express their opinion that it is one of the most common etiological agents of food infection in man, and that many outbreaks heretofore attributed to other organisms have been due to this. Among these is cited the outbreak reported by Winslow et al. (E. S. R., 50, p. 64), which was considered to be due to contamination with organisms of the paratyphoid type.

An outbreak of pork pie poisoning at Derby, C. F. PECKHAM (*Jour. Hyg. [London], 22 (1923), No. 1, pp. 69–76*).—This outbreak of food infection, which involved 37 cases with no deaths, was traced to commercially prepared pork pies. From one of the pies and from a tank of water on the premises where the pies were made, organisms were isolated which appeared to be identical with *Bacillus enteritidis* (Gaertner).

ANIMAL PRODUCTION.

Notes on the drainage from tower silos, W. GODDEN (*Jour. Agr. Sci. [England], 13 (1923), No. 4, pp. 462–466*).—The drainage from a 12-ft., 110-ton silo at the Rowett Research Institute was collected for two hours each day from August 10, soon after filling, to September 1, when the flow had practically ceased. The silage consisted of a moderately mature mixed crop of beans, peas, oats, and tares, sown at the rate of 1, 1.5, 3, and 0.5 bu., respectively, per acre. The rate of flow of the drainage from the silo was greatest soon after filling, and it also contained the largest amount of dry matter at that time.

The drainage from two other silos was also collected and analyzed on different days. One silo was partially filled with clover and rye grass between July 13 and August 2, and sample A was taken on August 8. A somewhat immature mixture of bean, pea, oat, and tare silage was added to this silo on August 18, and sample B was taken on September 4, when the liquid was draining away at the rate of 823 gal. per 24 hours. The other silo was filled with a mixture of beans, peas, oats, and tares between August 14 and September 7, and samples C, D, and E were taken on August 25 and 31 and September 6, respectively. The following table shows the mineral and nutrient contents of the drainage liquids:

Composition of the drainage liquids from silos.

Sample.	Dry matter per 100 gal.	Composition of dry matter.						
		Crude protein.	Ash.	CaO.	P_2O_5.	SO_3.	K_2O.	Ratio CaO: P_2O_5.
	Lbs.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	
Institute	81.88	29.1	19.1	3.24	1.55	0.27	0.99	2.1
A	67.54	17.4	20.8	4.31	1.26	.19	1.51	3.4
B	47.02	30.8	22.3	2.97	2.15	.28	1.78	1.4
C, D, and E	60.89	28.7	23.4	2.25	2.00	.24	2.07	1.1

All the results indicate a material loss in the nitrogenous substances and minerals in the drainage liquid.

Wheat offals: Their grading, composition, and digestibility, H. E. WOODMAN (*Jour. Agr. Sci.* [*England*], *13* (*1923*), *No. 4, pp. 483–507*).—The changes in the grades of wheat feeds since the war are discussed, and the average composition of seven arbitrary grades, based on the amounts of each passing through sieves of different sizes, are reported. It is concluded that three grades would suffice, i. e., bran (over 75 per cent not passing through a No. 24 wire sieve), middlings (25 per cent passing through and 50 per cent not passing through a No. 56 sieve), fine middlings (over 75 per cent passing through a No. 56 sieve). The chemical composition of the grades differed, the carbohydrate and protein content increasing and the crude fiber and ash decreasing with the finenes.

The digestibility of broad bran (the coarser material sifted from bran), bran, middlings, and fine middlings was determined in experiments with wethers. Two animals were first fed on a basal ration of 500 gm. of meadow hay and 100 gm. of linseed cake, followed by periods in which 600 gm. of ordinary bran and 600 gm. of broad bran were added. The basal ration fed in making the digestibility determinations with middlings and fine middlings was increased by 50 gm. of linseed meal per day. The periods during which each feed was fed were two weeks in length, with preliminary periods of one week. The following table gives a summary of the coefficients of digestibility calculated for each feed:

Coefficients of digestibility for various wheat feeds.

Feeds.	Dry matter.	Organic matter.	Crude protein.	Fat.	Carbohydrates and fiber.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Broad bran	57.9	61.6	75.3	71.0	62.7
Ordinary bran	57.0	60.9	72.3	71.0	63.5
Middlings	71.5	75.4	72.7	86.0	78.2
Fine middlings	75.8	78.2	74.0	88.3	80.9

Investigations of the low digestibility of the fat indicated that the advancing age of the sheep was probably the disturbing factor. The author noted an increase in the dry matter, organic matter, fat, and carbohydrates digested as the fineness of the feed increased, but the protein seemed to be about equally digested in the four feeds. No significant differences in the feeding values of the two types of bran were evident.

Investigations of the use of colonial products in the feeding of livestock, P. Dechambre, F. Heim, and [L.] Lepoutre (*Recherches sur l'Emploi des Produits Coloniaux dans l'Alimentation du Bétail. Paris: Com. Encour. Recherches Sci. Colon., 1922, pp. 32*).—The chemical composition of different parts of the rice plant, tapioca, peanut cake, and palm nut cake is given, and discussed with reference to their desirability as feeds for the different classes of animals.

Feeding stuffs reports, 1921–1922, J. W. Kellogg (*Penn. Dept. Agr. Buls. 367 (1922), pp. 287; 376 (1923), pp. 231*).—The guaranteed and found protein, fat, and fiber analyses and the contents as determined by a microscopic examination of the feeding stuffs officially inspected in the State during the calendar years 1921 and 1922 are tabulated. The report for 1920 has been noted (E. S. R., 47, p. 274).

Investigations of the phosphorus requirements of animal bodies and the phosphorus content of the feeds of our domestic animals, C. Blass (*Untersuchungen über den Phosphatbedarf des Tierkörpers und den Phosphatgehalt der Nahrung unserer Haustiere. Diss., Hessische Ludwigs-Univ., Giessen, 1922, pp. 57*).—This is mainly a discussion of the phosphorous and calcium requirements of plants and animals for growth and the content of each in different animal feeds.

Types and market classes of live stock, H. W. Vaughan (*Columbus, Ohio: R. G. Adams & Co., 1923, 9. ed., rev., pp. 544, pl. 1, figs. 212*).—The book previously noted (E. S. R., 43, p. 697) has been revised and enlarged, including the addition of a chapter on American sheep markets.

The origin and quality of commercial live stock marketed in Canada, 1920–1922, H. S. Arkell (*Canada Dept. Agr., Livestock Branch Rpt. 3 (1923), pp. 112, figs. 2*).—This is a tabulated summary from data collected by the Markets Intelligence and Stock Yards Service of the origin, quality, and numbers of cattle, hogs, and sheep received at the livestock markets in Canada from January 1, 1920, to December 31, 1922.

Reviews of the frozen meat trade, 1922–1923, W. Weddel & Co., Ltd. (*Weddel's Ann. Rev. Frozen Meat Trade, 35 (1922), pp. 31, pl. 1; 36 (1923), pp. 26, pl. 1*).—These reports continue the summary of the British trade in frozen meats during 1922 and 1923, previously noted (E. S. R., 47, p. 275).

Silage feeding investigations, 1922–23, C. W. McCampbell and W. R. Horlacher (*Kansas Sta. Circ. 105 (1924), pp. 10, figs. 2*).—The results of cattle feeding investigations are reported, in continuation of those previously noted (E. S. R., 50, p. 65).

The amount of cottonseed cake necessary to supplement a full silage ration most economically in the fattening of baby beef (pp. 1–6).—To secure information on the amounts of cottonseed cake that can be most economically added to a ration of shelled corn and cane silage full fed and 2 lbs. of alfalfa hay for baby beef production, 5 lots of 10 grade Hereford steers received the basal ration plus no cottonseed cake, 0.5, 1, 1.5, and 2 lbs. of cottonseed cake daily per head in lots 1, 2, 3, 4, and 5, respectively. Another lot (6) consisting of 10 heifers also received the same ration as lot 5. The average weights of the animals in the different lots varied from 339 to 357 lbs. The average daily gains made during the 231-day test were, in lots 1 to 6, 1.84. 1.98, 2.06, 2.07, 2.12, and 2.04 lbs., respectively. The calculated profits per 100 lbs. were largest in the lot receiving 1 lb. of cottonseed cake, followed in order by lots 2, 1, 4, and 5, with heavy losses in lot 6. It is stated that the heifers were fatter, dressed as well, and looked as good on the hooks as the steers receiving the similar ration, but the selling price of the heifers was $1.50 per 100 lbs. less than that of the steers. The results indicate the advisability of adding up to 1 lb. of cottonseed cake daily to the rations of baby beeves.

The influence of winter rations upon summer gains on pasture alone (pp. 6–8).—The results of this experiment have been previously noted (E. S. R., 49, p. 868).

Finishing grass-fat cattle on grain (pp. 9, 10).—Two lots of steers were fed through the three years in a manner similar to those in the above experiment with like results, but from September 4, to November 4, 1922, they were left on bluestem grass pasture and received in addition a full feed of corn. After this they were fed silage, alafalfa hay, and ground corn for 23 days in dry lot. During the grass feeding period average daily gains of 1.56 lbs. were made, followed by gains of 1.22 lbs. during the dry lot feeding. The 83-day feeding of these steers increased their value 2 cts. per pound over similar cattle marketed off grass in the above experiment. The calculated net returns were also $14.16 per head greater.

The influence of foundation herds selected by an agricultural committee on sheep breeding in Oberhessen, O. Lehr (*Einfluss der Stammherden des Landwirtschaftskammer-Ausschusses für die Provinz Oberhessen auf die Schafzucht Oberhessens. Diss., Hessische Ludwigs-Univ., Giessen, 1922, pp. 34*).—A review is given of the improvement which has been brought about in the sheep production in Oberhessen through the selection of foundation herds and special breeding and crossing under the supervision of the special committee appointed for the province over 10 years ago.

Annual wool review, 1922 [and 1923], J. B. McPherson (*Bul. Natl. Assoc. Wool Manfrs., 53 (1923), Extra No. 1, pp. 129–264, pls. 6, figs. 13; 54 (1924), Extra No. 1, pp. 81–214, pls. 6*).—Reviews of the wool situation in the United States during 1922 and 1923 similar to that for 1921 (E. S. R., 47, p. 670) are given, with comparisons.

Feeding hogs in Wyoming, L. P. Reeve and D. J. Robertson (*Wyo. Farm Bul., 12 (1923), No. 2, pp. 40, figs. 11*).—The general principles of care, management, and feeding of hogs are discussed with special reference to Wyoming conditions. A part of the bulletin, written by C. Elder, also deals with hog diseases.

Self-feeders for fattening swine, L. A. Weaver (*Missouri Sta. Circ. 118 (1924), pp. 8, fig. 1*).—The experiments here noted have been more fully reported (E. S. R., 37, p. 69).

[Poultry experiments at the Cap Rouge Experimental Station], G. A. Langelier (*Canada Expt. Farms, Cap Rouge (Que.) Sta. Rpt. Supt. 1922, pp. 77–83*).—The experiments reported deal with the hatchability of eggs and comparisons of feeds.

Fertility and hatchability of eggs, also viability of chicks from pullets and from hens.—A comparison of the percentages of fertile eggs and chicks hatched from pullets and hens showed very little differences during 1916, 1917, and 1922. In 1922 the eggs from hens and pullets compared, respectively, as follows: In fertility 84 and 85 per cent, percentage of fertile eggs hatched 46 and 48, and percentage of chicks hatched alive on July 1, 79 and 82 per cent.

Commercial v. home mixed feeds for winter laying.—Full O' Pep scratch grain and laying mash was compared with a home-mixed scratch grain composed of equal parts of wheat, barley, oats, cracked corn, and buckwheat and a home-mixed laying mash of equal parts of bran, middlings, ground oats, corn meal, and meat meal for egg production during the winter 1922-23. A total of 427 eggs was laid by the 25 birds receiving the commercial feeds as compared with 400 by a like number of birds receiving home-mixed feeds. The cost of the commercial feed was so much greater, amounting to 6.5 cts. per dozen eggs, that the profits were less with them.

Green bones, meat meal, raw meat, skim milk compared for laying hens.—Using 4 lots of 20 pullets each, skim milk at 25 cts. per 100 lbs., meat meal at $3.75 per 100 lbs., raw meat at $3 per 100 lbs., and green bone at $5 per 100 lbs. were compared as protein supplements to a basal ration for egg production. The total eggs produced during the 4 months, November to February, by the respective lots were 582, 505, 405, and 230. The calculated costs per dozen were 23.4, 25.3, 39.6, and 74.7 cts. Approximately 390 lbs. of grain were consumed by each lot.

Clover hay, Epsom salts, roots, sprouted oats compared for laying hens.—The following number of eggs were laid by lots of 20 pullets each receiving supplements to a basal ration during the winter of 1922–23: Sprouted oats 361 eggs, roots 284, clover 338, and Epsom salts 388 eggs. Approximately 390 lbs. of grain were consumed by all lots. In discussing the results, the author states that in experiments carried on during the winters of 1916 to 1921 dry clover leaves were better stimulants to egg production than green feeds, and this year's results indicate that Epsom salts are better than the green feeds.

Poultry [experiments at the Ste. Anne de la Pocatière Experimental Station], J. A. Ste. Marie (*Canada Expt. Farms, Ste. Anne de la Pocatière (Que.) Sta. Rpt. Supt. 1922, pp. 30–34*).—The results of several experiments with poultry are reported.

Feeding pullets and yearling hens.—From a comparison of the egg production and feed consumption of Rhode Island Red pullets and yearling hens, it was calculated that the profits per bird were over twice as great with pullets.

Wide and narrow ration for fattening cockerels.—In comparing a ration of 6 parts of skim milk, 1 part of ground oats, 1 part of corn meal, and 1 part of buckwheat, having a nutritive ratio of 1: 5.9, with a ration of 4 parts of skim milk, 1 part of ground oats, and 1 part of shorts having a nutritive ratio of 1: 4.1, it was found during a 21-day fattening period that the cockerels on the former ration made average gains of 2.08 lbs. as compared with 1.58 lbs. of gain by the lot on the second ration. The calculated profits were also greater on the wide ration.

Beef scrap v. eggs v. sprouted oats and mangels for the rearing of chickens.—Three lots of 30 baby chicks each received a standard ration plus beef scrap, eggs, and sprouted oats and mangels in the different lots. At the end of 5 weeks there were 16, 21, and 19 chicks, respectively, alive in the different lots. The average gains made were 3.86, 4.02, and 3.42 oz. per bird.

Beef scrap v. meat v. milk as feed for the laying hens.—Protein supplements to a basal ration of dry mash (corn meal, ground oats, and bran, 1: 1: 1) and scratch feed (cracked corn, wheat, and oats, 2: 2: 1) were compared as feeds for egg production by using 4 lots of 12 pullets each. Lot 1 had 15 per cent of beef scrap added to the dry mash, lot 2 had access to cooked horse flesh at all times, lot 3 received skim milk at will, whereas lot 4 received no other feed. The number of eggs laid by the respective lots were 623, 772, 683, and 623 during the 5-month test period. The estimated feed cost per dozen eggs was 25 cts. in all but lot 2, in which it was 22 cts.

Incubation, P. Cook (*Alhambra, Calif.: Weimar Press, 1923, pp. 31, figs. 5*).—The difficulties encountered in artificial incubation of hens' eggs and the means of avoiding them are discussed, with special reference to the use of large unit incubators.

The accredited hatchery as a factor in standardizing market chickens and eggs, R. B. SLOCUM (*Poultry Sci., 3 (1923–24), No. 2, pp. 60–64*).—A discussion is given of the advantages which an accredited hatchery system would have in making the poultry and eggs offered on the market more uniform in quality.

Profitable culling and selective flock breeding, compiled by H. W. JACKSON and G. M. CURTIS (*Dayton, Ohio: Rel. Poultry Jour. Pub. Co., 1923, pp. 320, figs. 197*).—Detailed consideration is given to the principles on which poultry culling is based, with special reference to the culling of the different breeds of poultry and in different types of flocks.

Poultry feeding in Montana, G. P. GOODEARL (*Montana Sta. Circ. 121 (1923), pp. 13*).—The principles of feeding laying hens and fattening poultry are discussed, with special reference to the nutritive value of feeds available in the State.

Feeding skimmilk or buttermilk to chicks, D. C. KENNARD (*Ohio Sta. Mo. Bul., 9 (1924), No. 1–2, pp. 27–30, figs. 2*).—A feeder for skim milk or buttermilk which is sanitary and adjustable to the growth of the chicks is described.

Rearing chicks indoors, D. C. KENNARD (*Ohio Sta. Mo. Bul., 9 (1924), No. 1–2, pp. 15–21, figs. 2*).—The feeding of cod liver oil or raw egg yolk is recommended to prevent the occurrence of leg weakness in chickens raised in confinement. The results of two experiments are also given in which chicks receiving additions of 2.5 and 5 per cent of cod liver oil or 15 per cent of raw egg yolk to the ration grew rapidly and did not develop leg weakness, whereas leg weakness or death occurred in the check lots.

Why chicks die, W. H. ALLEN (*New Jersey Stas., Hints to Poultrymen, 12 (1924), No. 7, pp. 4*).—Suggestions are given to prevent losses of baby chicks, largely through better care and feeding methods.

Breeding and care of the albino rat for research purposes, M. J. GREENMAN and F. L. DUHRING (*Philadelphia: Wistar Inst. Anat. and Biol., 1923, pp. 109, pls. 2, figs. 20*).—This book has been prepared to supply information on the methods of feeding, breeding, and caring for rats used for experimental purposes. The construction of the necessary equipment for rat breeding is described in detail.

DAIRY FARMING—DAIRYING.

[Experiments dealing with dairy products] (*Ontario Agr. Col. and Expt. Farm Ann. Rpt., 48 (1922), pp. 29–36*).—The results of several experiments carried on by the dairy husbandry department are reported.

Relation of fat in milk to yield and quality of cheese.—By dividing the milk as delivered to the cheese branch into two lots containing low and high butterfat percentages, the effect of the fat content on the cheese yield has been studied. The average fat contents of the two lots were 3.2 and 3.7 per cent. The yields of cheese were 88.7 and 99.95 lbs., respectively, per 1,000 lbs. of milk. There was practically no difference in the acidity of the milk or the whey or in the losses of fat in the whey, and the scores of the cheese from both lots were similar.

Effect of sweet clover fed to cows producing milk for Cheddar cheese making.—Milk from the college herd was made into Cheddar cheese on May 25 and 31 while the cows were stabled at night but receiving natural grass pasture during the day. After one week's pasture on sweet clover, the milk of June 7 and 12 from the same cows was again made into cheese. The average score of the flavor of the cheese made at the first date was 39.5, as compared with 36 for the second and 39 for the third and fourth. Because of inability to explain the 36 score the results are considered misleading, and the cheese made from milk received from dairies where sweet-clover pasture was used was compared in seven tests with cheese made from the milk received from dairies not pasturing sweet clover. The conditions of acidity, fat percentages, etc., were similar in the milk received for both groups, but the yields of cheese were 94.24 lbs. from the no clover lot and 89.19 lbs. per 1,000 lbs. of milk from the clover lot. The cheese made from the no clover milk also scored 0.81 points higher in flavor and 1.19 higher for the total score.

Effect of having curds laid on the flat and on edge, after matting.—In studying the effect of working the curd on the flat method and on the edge, the curd from 14 vats of milk were divided into 2 parts, 1 part of each being worked each way after matting and up to near the time of milling. The curd placed on edge scored 2 points higher in flavor, but other qualities were very similar.

Effect of increasing the quantity of rennet in cheese manufacture.—The use of 4, 5, 6, 7, and 8 oz. of rennet per 1,000 lbs. of milk for cheese making was compared with the usual amount of 3 oz. It was found that the extra amount of rennet produced slightly more cheese, but not enough more to pay for the rennet, and the quality of texture and closeness was slightly better when the normal amount was used.

Relation of the acidity of the milk separated to the acidity in the cream.—Tests of the relation of the acidity of cream to that of the original whole milk, in 14 lots of raw and 14 lots of pasteurized milk, showed that the separated cream contained a lower percentage acidity than the milk from which it was made.

Development of acidity in milk and cream.—Milk and cream held at 45° F. developed little acidity, but when held at 60° or higher acid formation was more rapid.

The pasteurization of buttermilk at creameries where the cream is not pasteurized.—Buttermilk was successfully pasteurized at 170° for 10 minutes when well agitated, but the products separated on standing. By neutralization the separation was prevented, but the keeping qualities were injured.

The effect of sweet clover on the flavor of butter.—Butter made from milk from cows before and while pasturing on sweet clover was compared as to flavor, but no evidence of any flavor being imparted by the clover was noticed in any of the samples.

Whey butter.—Butter made from cream separated from whey was found to compare favorably with butter made from cream separated from fresh milk.

Tests for whipping cream.—Twenty-five experiments in whipping cream indicated that the cream should contain 28 per cent of fat, be cooled to 45°, and held for 24 hours. Lemon juice may aid the whipping process if the cream is too fresh, but milk powder had no effect.

Milk powders for culture (starter) making (Farm Dairy).—Skim milk or 10 per cent milk stock or Drimilk with water were found to be satisfactory media for the production of starter.

Butter-making experiments.—A study of the churning conditions affecting the quality of butter and the loss of butterfat indicated that "the best results may be obtained in physical quality of butter and also in exhaustiveness of churnings where the churn is filled not less than half full and not more than two-thirds full. Where water and ice are used for cooling cream after pasteurization, the cream should be held from 10 to 20 hours before churning, especially during the summer season when the soft fats are in abundance. The lowest loss of fat in the buttermilk was obtained from cream which was held overnight."

Effect of using "starters" on quality of butter.—Powdered skim milks (Klim or Drimilk) were successfully used as media for starters, the butter made from them scoring as high as where ordinary skim milk starter was used.

Some dairy questions and answers, G. L. Waugh (*N. H. Univ.* [Agr.] *Ext. Bul. 22 (1923), pp. 19, figs. 8*).—Information of practical value dealing with methods and costs of milk production is popularly summarized, based on data collected from New Hampshire cow testing association records.

Twenty-fourth report of the dairy and food commissioner, [1921–1922], T. Holt (*Conn. Dairy and Food Commr. Rpt., 24 (1921–1922), pp. 24*).—This is a summary of the conditions of production and handling of dairy products in Connecticut during the period July 1, 1920, to June 30, 1922, as well as similar information on a few other food products.

Milk production, 1914 to 1920 [trans. title], W. Grimmer (*Milchw. Forsch., 1 (1923), No. 1, pp. 10–17*).—This is a brief technical review of the results of experiments dealing with milk production reported from the different countries of the world during the years 1914 to 1920.

[Report of the] inter-departmental committee on the laws, regulations, and procedure governing the sale of milk in Scotland, W. L. Mackenzie et al. (*Edinburgh: Govt., 1922, pp. 127*).—This report of the committee appointed to study the regulations governing the sale of milk in Scotland includes recommendations based on a thorough study of the situation and an examination of 52 witnesses. Certain reservations of individual members of the committee to parts of the report are also included.

The influence of fermented feed on the composition of milk fat [trans. title], F. Kieferle (*Milchw. Forsch., 1 (1923), No. 1, pp. 2–14*).—The quality of the butterfat produced by cows receiving ordinary and electrically preserved silage was studied at the Weihenstephan High School. The first experiment was carried on with two groups of eight Simmentaler cows, each producing from 9 to 10 liters of milk per day. The control group of cows received a basal ration per cow of 12 kg. of chopped hay, 1.5 of wheat bran, and 1 kg. of ground beans daily during the entire test, which lasted from January 27 to March 24. The experimental group had 3 kg. of dry matter from the hay replaced by 15 kg. of silage in the first period, and 6 kg. of dry matter in the hay replaced by 30 kg. of silage in the second period and 30 kg. of electrically preserved silage in the third period. This group received the basal ration only prior to the beginning of the experiment and also for a final period of about two weeks following the test periods.

The experimental periods varied in length, but they were usually about one week, with one week interavls for transition periods between. The total milk from each group was skimmed, the cream churned, and the determinations made on the butterfat, the averages for each period of which are given in the following table:

Average quality of butterfat produced by cows receiving fermented feeds.

Period.	Reichert-Meissl number.		Polenske number.		Saponification number.		Iodin number.		Refractive index.	
	Control group.	Experimental group.	Control group.	Experimental group.	Control group.	Experimental group.	Control group.	Experimental group.	Control group.	Experimental group.
Preliminary	29.30	29.31	2.40	2.45	228.2	229.4	31.90	32.95	42.0	42.3
1	29.98	31.36	2.94	2.72	229.6	230.3	31.60	32.70	42.2	42.4
2	29.89	34.29	2.68	2.77	229.2	232.6	31.84	32.46	42.3	42.3
3	29.39	30.59	2.32	2.27	228.1	228.6	33.40	34.40	42.6	42.9
Final	29.54	30.18	2.56	2.42	228.7	229.1	32.30	32.90	42.3	42.4

The Reichert-Meissl number and the Polenske number of the butterfat of one group of cows were also reported for another year with similar results. The author concluded from the two experiments that the feeding of fermented silage had a vey favorable effect not only on the properties of the butter but on the composition of the butterfat. There was an increase in the volatile fatty acids which increased the value of the butter. The amino acids formed in the silage through fermentation are directly concerned with the production of glycerids in the butter.

A study of the decomposition products of spore-bearing bacteria in heated milk, H. Lisk (*Jour. Bact., 9 (1924), No. 1, pp. 1–12*).—In studies carried on at Johns Hopkins University the changes produced in milk by the growth of eight aerobic spore-bearing bacilli isolated from samples of milk are described. The organisms isolated were *Bacillus cereus*, *B. albolactus*, *B. mesentericus-vulgatus*, *B. mesentericus-fuscus*, *B. subtilis-viscosus*, *B. megatherium*, *B. simplex*, and *B. brevis*. In carrying out the experiments, 1 cc. of a plain milk culture of each organism was introduced into 400 cc. of sterile milk and incubated for 8 or 20 days at 37° C., after which the samples were analyzed for changes in ammonia, amino nitrogen, lactose, and volatile acid content and changes in H-ion concentration.

Detailed results of the changes produced by each organism are tabulated, a summary of which indicated that the spore-bearing bacilli produced increases in the ammonia and amino nitrogen formation in the samples. The proteins were decomposed by some of the organisms even to the formation of indol, and hydrogen sulphid was also formed by some. Thus the actions of these aerobic spore-bearing bacilli are in many respects similar to the actions of anaerobic bacilli from milk.

"Ropy" cream, O. C. Ballhausen (*Agr. Gaz. N. S. Wales, 35 (1924), No. 2, p. 143*).—The organism causing ropy cream was found to have contaminated the cows and the dairy utensils through the water supply on a certain farm. Keeping the cows from this water and carefully cleaning the utensils prevented any recurrence of the trouble.

Standardising New South Wales dairy products, O. C. Ballhausen and J. Marrott (*Agr. Gaz. N. S. Wales, 35 (1924), No. 3, pp. 191–197*).—This is a discussion of the improvement in the quality of dairy products, especially butter, which has occurred in New South Wales through Government supervision and education of the farmers and manufacturers of dairy products since the enactment of the Dairy Industry Act in 1915.

VETERINARY MEDICINE.

A textbook of pharmacology and therapeutics or the action of drugs in health and disease, A. R. Cushny (*Philadelphia: Lea & Febiger, 1924, 8. ed., rev., pp. X+17–707, figs. 73*).—In this textbook of pharmacology, of which this is the eighth edition, the subject matter, following a general introduction, is presented in three parts dealing, respectively, with substances which are characterized chiefly by their local action, substances characterized chiefly by their action after absorption, and the heavy metals.

The microchemistry of medicines and drugs, A. Mayrhofer (*Mikrochemie der Arzneimittel und Gifte. Berlin: Urban & Schwarzenberg, 1923, pp. XXI+285, figs. 53*).—The first part of this manual describes the apparatus, reagents, and general methods employed in microchemical analysis. This is followed by the application of these methods to the identification of metallic ions, inorganic and organic acids, and salts. The last part consists of tables and a diagrammatic scheme for the analysis of unknown mixtures.

Useful drugs (*Chicago: Amer. Med. Assoc., 1923, 6. ed.,* [*rev.*], *pp. 180*).—In this revision of the handbook previously noted (E. S. R., 43, p. 580), several drugs listed in the previous edition have been omitted and others added, the latter including chaulmoogra oil and chaulmestrol (the ethyl esters of acids of chaulmoogra oil), insulin, nitrous oxid, and diphtheria toxin-antitoxin mixture.

Carbon tetrachlorid poisoning: Report of two fatal cases and a series of animal experiments, B. M. PHELPS and C. H. HU (*Jour. Amer. Med. Assoc., 82* (*1924*), *No. 16, pp. 1254–1256*).—"In the two fatal cases of carbon tetrachlorid poisoning reported the chief pathologic finding was central necrosis of the liver. In one case the suprarenal glands showed necrosis of the cortical cells. The suprarenal glands in the other case were not preserved.

"Carbon tetrachlorid produces central necrosis of the liver and necrosis of the suprarenal cortex in guinea pigs. Regeneration of liver cells following central necrosis is very rapid. The symptoms following ingestion of the drug in human cases are probably associated with the presence of central necrosis of the liver, and the absence of this lesion in the previously reported cases is probably due to the rapid regeneration of the liver cells."

Annual report of the Civil Veterinary Department, Bihar and Orissa, for the year 1922–23, D. QUINLAN (*Bihar and Orissa Civ. Vet. Dept. Ann. Rpt. 1922–23, pp.* [*3*]+*17*+*XXIV*+*4, pl. 1*).—This is the usual annual report (E. S. R., 48, p. 878).

State sanitary requirements governing admission of livestock (*U. S. Dept. Agr., Misc. Circ. 14* (*1924*), *pp. II*+*91*).—This compilation, in pocket form, supersedes the issue of March 30, 1922.

Infectious abortion of cattle, C. D. MCGILVRAY (*Ontario Dept. Agr. Bul. 304* (*1924*), *pp. 23, figs. 7*).—This is a practical summary of information.

Carriers of Bang abortion bacilli and the agglutination test, E. C. SCHROEDER and W. E. COTTON (*Jour. Amer. Vet. Med. Assoc., 64* (*1924*), *No. 4, pp. 479–481*).—Milk obtained from 56 cows reacting to tuberculin was found in 30 cases to give positive results with the agglutination test in dilutions of 1 to 200 or higher and in 26 cases with dilutions no higher than 1 to 100. The low reacting milk on injection into guinea pigs failed to cause lesions to develop, while the milk of 25 of the 30 high reacting cows caused a development of lesions in guinea pigs.

"While we are not ready to say definitely that a cow is not a carrier of abortion bacilli unless she reacts with the agglutination test in a dilution higher than 1 to 100, the fact that not one among 26 low reacting cows was proved a carrier with tests which proved 25 among 30 cows which reacted with dilutions of 1 to 200 or higher to be carriers is quite impressive, particularly if it is noted that 12 more samples of milk from the smaller number of low reacting cows were tested than from the high reacting cows, and that the number of guinea pigs which served to test the milk from the low reacting was 134 greater than the number which served to test the milk of the high reacting cows."

Practical value of serological and other tests in the control of abortion disease, C. H. KITSELMAN (*Vet. Med., 19* (*1924*), *No. 5, pp. 312, 313*).—This is a brief discussion of the agglutination test for the control of bovine abortion, particularly from the standpoint of interpretation of reactions and herd separation on the basis of this test.

The agglutination test for infectious abortion (*Ontario Vet. Col. Rpt. 1923, pp. 39–44*).—Methods for conducting the agglutination test for bovine infectious abortion are discussed, with experimental data. A rapid method, based on macroscopic slide agglutination, is described in detail, with a comparison of the results obtained with it and with the ordinary agglutination and complement fixation tests on 224 sera. The rapid method gave results agreeing with the other tests in 210 cases, 53 positive and 157 negative. The test was positive with all but one of the sera that gave positive results in 1:100 dilution with the other tests. The method is thought to offer possibilities as a rapid and convenient means of establishing a herd diagnosis, but not as a method to replace the other tests for more careful work.

A modification of the complement fixation test for infectious abortion (*Ontario Vet. Col. Rpt. 1923, pp. 44–50*).—In the method described, the antigen employed was a filtrate prepared by growing seven strains of *Bacterium abortus* in beef infusion broth made with Difco standardized peptone for 10 days, filtering through a Berkefeld candle, and adding 0.5 per cent phenol. The filtrate as thus prepared is said to have strong fixing power and very little anticomplementary action.

The hemolysin was prepared by injecting into rabbits sheep corpuscles carefully freed from serum. Five intravenous injections of the undiluted corpuscles were given on 5 successive days, with gradually increasing doses of from 0.5 to 2.5 cc. Trial bleedings were made on the fourth day after the last injection, and if these proved satisfactory the animals were bled profusely.

A comparison of ice box, water bath, and incubator fixation showed that the most satisfactory results can be obtained with ice box fixation overnight. A comparison of results obtained by the method outlined and by the agglutination test on 39 sera showed agreement by the two methods in all but 4 cases.

The agglutination curve in guinea pigs in relation to the diagnosis of abortion disease (*Ontario Vet. Col. Rpt. 1923, pp. 51–54, fig. 1*).—In the work reported in this paper the sera of 19 guinea pigs which had previously been injected intraperitoneally, 10 with living cultures and 9 with heat-killed cultures of *Bacterium abortus*, were used for the agglutination test. The composite curves of the agglutinin titers of the sera of the animals receiving the living cultures and those receiving the killed cultures showed in the former case an increase in agglutinin titer up to about the eightieth day, followed by a decrease, while the titer of the sera of those receiving the killed cultures showed a steady decrease.

Cultures other than Bacterium abortus agglutinated by anti-Bacterium abortus serum (*Ontario Vet. Col. Rpt. 1923, pp. 56–58*).—A few miscellaneous tests on the specificity of *B. abortus* are summarized as follows:

Agglutination tests conducted on 24 cattle sera obtained at an abattoir using antigens prepared from *B. abortus*, *B. coli*, and *Pseudomonas pyocyanea*, showed that sera negative to *B. abortus* would agglutinate the other two in fairly high dilutions.

The sera of three rabbits immunized, respectively, against the three organisms noted above were used for agglutination tests with each organism. Each serum proved specific for its own antigen.

Four normal horse sera agglutinated *B. coli* and *P. pyocyanea* in 1:50 and 1:100 dilution, but did not agglutinate *B. abortus*. One *B. abortus* immune horse serum agglutinated all three antigens. A heated and an unheated antiabortion serum of high titer were tested for agglutinins with the three antigens. The unheated serum agglutinated all three antigens, while the heated gave an incomplete reaction with *B. abortus* and negative with the other two.

The significance of vitamin B in the natural immunity of pigeons to anthrax [trans. title], L. Corda (*Ztschr. Hyg. u. Infektionskrank., 100 (1923), No. 2, pp. 129–139, figs. 2*).—To determine whether the natural immunity of pigeons to anthrax is due to vitamin B, pigeons were fed polished rice with 2 gm. of dried asparagus as a source of vitamin B, and others were given this amount of asparagus with no other food. The amount of asparagus administered proved sufficient to protect the pigeons against polyneuritis for at least 50 days. Those receiving asparagus and polished rice withstood the injection of anthrax bacilli, while those receiving the asparagus alone succumbed to the infection. The loss of immunity is considered to be the result of starvation rather than lack of vitamin B, as suggested by Blondo (E. S. R., 48, p. 774) and others.

The intradermal vaccination of sheep against anthrax [trans. title], H. Velu (*Compt. Rend. Soc. Biol.* [*Paris*], *90* (*1924*), *No. 11, pp. 746, 747*).—The author reports the successful immunization of sheep against anthrax by a single intradermal injection of vaccine, as recommended by Brocq-Rousseu and Urbain for horses (E. S. R., 50, p. 79).

Anthrax in the tannery industry, H. Leymann (*Internatl. Labor Off., Geneva, Studies and Rpts., Ser. F, No. 7* (*1923*), *pp. 30*).—This is a report of a committee established in December, 1922. Under the heading of anthrax in the tannery industry the paper discusses the Seymour-Jones process, the pickling process, and the lye process. Two appendixes are included, dealing, respectively, with instructions for disinfection by the pickling process (pp. 23–26) and the lye process (pp. 27–30) of anthrax-infected hides and skins in tanyards.

The possible danger of absorption of toxin of Bacillus botulinus through fresh wounds and from mucous surfaces, J. C. Geiger (*Amer. Jour. Pub. Health, 14* (*1924*), *No. 4, pp. 309, 310*).—The possibility of acquiring botulism through absorption of the toxin was studied by experiments on guinea pigs. Home canned corn and string beans which had been proved to contain botulinus toxin type A were rubbed on scarified skin surfaces and in one case on an uninjured skin area. Control animals receiving the same treatment were inoculated subcutaneously with type A antitoxin. All of the animals of the control group remained well, and all of the other group died with the exception of the one whose skin was intact. This is thought to indicate that absorption of botulinus toxin may occur through fresh wounds and mucous surfaces.

Production of monovalent botulinus antitoxic serum types A and B, M. W. Wheeler (*Jour. Immunol., 8* (*1923*), *No. 6, pp. 501–505*).—A description is given of the methods employed at the New York State Department of Health in the production of monovalent botulinus antitoxic serum by the subcutaneous inoculation of horses with homologous toxin. Three methods of immunization were used, the first consisting of frequent injections of toxin, with rapid increase in dosage; the second of slow increase of dosage, with intervals of rest; and the third of frequent injections of toxin, with slow increase in dosage. The third method is considered to have advantages over the other two as producing very potent serums, with less danger of the animals succumbing during treatment.

Foot-and-mouth disease (*Jour. Min. Agr.* [*Gt. Brit.*], *30* (*1924*), *No. 12, pp. 1084–1087*).—This is a statement of the foot-and-mouth disease situation in Great Britain made by the Minister of Agriculture on February 18.

Malta fever, A. C. Evans (*Pub. Health Rpts.* [*U. S.*], *39* (*1924*), *No. 11, pp. 501–518*).—A review is given of the literature on the prevalence of *Brucella melitensis* in cow's milk, the infectiousness of bovine strains of *B. melitensis* for man, cases of Malta fever which could not be traced to infection from goats, and titers considered indicative of *B. melitensis* infection in man. This is followed by data obtained in the testing for agglutinins specific to *B. melitensis* of 500 human sera from patients suffering from a variety of diseases. Of these, 59 gave a definitely positive reaction in dilutions of from 1 to 5 or higher. One serum had a titer of 1:320, but no other was higher than 1:40. The patient whose serum had a titer of 1:320 was in the habit of drinking raw cow's milk, but had never drunk goat's milk nor eaten cheese made from goat's milk. Absorption tests with this serum gave positive results with the abortus (bovine) variety of *B. melitensis*.

These data, together with the evidence reviewed, point to cattle as being a possible source of infection with Malta fever. An extensive list of references to the literature is appended.

Tuberculin hypersensitiveness without infection in guinea pigs, H. Zinsser and S. A. Petroff (*Jour. Immunol., 9 (1924), No. 2, pp. 85–87, fig. 1*).—Further data are reported confirming the conclusions drawn by Petroff (E. S. R., 50, p. 80) that tuberculin skin reactiveness can be obtained in guinea pigs by injections of dead tubercle bacilli, that heating to 100° C. does not interfere with the reaction, and that if sufficient amounts are injected the reactions appear as rapidly and are as intensive as after injection of living bacilli.

On the loss of acid fastness and granular disaggregation in Bacillus tuberculosis of old cultures [trans. title], A. Fontes (*Mem. Inst. Oswaldo Cruz, 15 (1922), No. 1, pp. 181–185; trans. pp. 97–100*).—This is a repo[illegible] of studies conducted by the Institute Oswaldo Cruz.

Injection of cattle with B. tuberculosis (avian) and results of subsequent tuberculin tests, C. Elder and A. M. Lee (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 4, pp. 440–450, figs. 3*).—Six yearling steers giving negative reactions to the ophthalmic, intradermal, and subcutaneous tuberculin tests were injected, two intradermally, two subcutaneously, and two intramuscularly, with virulent cultures of avian tubercle bacilli. Four noninjected animals were used as controls, and in addition two healthy hens were injected with the same culture.

Of the injected calves, the two which had been injected intradermally gave negative intradermal tuberculin tests five months later, while the two injected subcutaneously and one of the two injected intramuscularly gave good intradermal reactions. Negative results were obtained in all cases with subcutaneous and ophthalmic tests.

It is concluded that cattle can be infected with avian tubercle bacilli when injected subcutaneously or intramuscularly with comparatively large numbers of organisms. The intradermal test is considered to be the most reliable for detecting avian tuberculosis in cattle.

The value of the intradermal-palpebral tuberculin reaction in cattle [trans. title], S. Runge (*Rocz. Nauk Rolnicz., 11 (1924), No. 1, pp. 11–25, figs. 3*).—Directions, with accompanying photographs, are given of the technique of applying the intradermal-palpebral tuberculin test to cattle. A positive reaction consists in an inflammatory swelling of the inoculated lid. This begins from 2 to 6 hours after the injection and is at its height in from 8 to 24 hours, after which it gradually subsides. There is a slight rise in temperature in from 6 to 24 hours after the inoculation. The author is of the opinion that the reaction gives a higher percentage of positive results than the ophthalmic reaction in cattle, but not so high a percentage in calves. The test, when positive, is more conspicuous and lasts longer than the simple ophthalmic test, and is thought to have greater diagnostic value on this account.

The Government institute for agricultural research in Pulawy in its fight with the cattle plague (Pestis bovina) in Poland [trans. title], L. Marchlewski (*Bibljot. Puławska, Państ. Inst. Nauk. Gosp. Wiejsk. Puławach*

(*Biblioth. Inst. Natl. Polonais Écon. Rurale Pulawy*), *No. 1* (*1923*), *pp. 25, figs. 16*).—This is a complete report of the methods adopted by the Polish Government for the eradication of rinderpest from Poland. A previous report of the general policy adopted and the method of preparing the vaccine has been noted from another source (E. S. R., 46, p. 279). The vaccination was so successful that the disease had practically died out by the end of 1922, after which time the serum treatment was abandoned and the few isolated cases were slaughtered.

Experiments to determine the susceptibility of weaned calves to cattle plague, Mohammad Bey Askar (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 42* (*1924*), *pp. 12, pls. 3*).—The author has found that suckling calves born of immune mothers are susceptible to cattle plague after they are weaned.

Immunizing young pigs against hog cholera, J. W. Benner (*Jour. Amer. Vet. Med. Assoc., 64* (*1924*), *No. 4, pp. 457–468*).—An experiment is reported in which 10 litters comprising 64 pigs were vaccinated against hog cholera when three weeks of age. In each litter one animal was given 1 cc. of virus alone and the others simultaneous treatment with 10 cc. of serum and 1 cc. of virus. Six of the animals died between the time of vaccination and of the trial injection. The remaining 58 were given a trial injection of 2 cc. of virus alone three months and three weeks after the original treatment, and all remained well.

"From the results obtained in this experiment it seems that a solid, lasting immunity is conferred by administering serum and virus by the simultaneous method to pigs when three weeks of age if farrowed by and suckling immune sows. It also seems that pigs under these conditions have sufficient immunity to protect them against the injection of 1 cc. of very potent virus, and that after this virus-alone injection they are permanently immune. The immunity which the pigs had prior to vaccination in no way prevented the conferring of a solid, lasting immunity, whether vaccinated by the simultaneous method or virus alone."

Investigations of Borna disease [trans. title], L. Marchand and R. Moussu (*Compt. Rend. Acad. Sci.* [*Paris*], *178* (*1924*), *No. 1, pp. 149–151*).—The authors report upon investigations conducted in France, where during and since the war many cases of epizootic cerebro-spinal meningitis have been observed. It has been demonstrated, through injecting a rabbit with an emulsion from the brain of a horse dead from the disease, that it may be transmitted to the rabbit, and causes the death of the animal in from 4 to 15 days. A repeated passage through the rabbit is said to increase the activity of the virus. It was found that inoculation of a fixed virus from the rabbit into the anterior chamber of the eye of a horse will, after three days' incubation, produce a fatal meningitis identical with the natural disease. Heating at from 60 to 70° C. for an hour destroys the activity of the virus. Preserved in glycerin, the virulence of the virus is maintained for at least 18 days. With the horse both the ingestion of virulent material and the subcutaneous injection fails to reproduce the malady.

On the occurrence of Piroplasma canis in the Dutch East Indies [trans. title], J. Witkamp (*Nederland. Indische Bl. Diergeneesk. en Dierent., 34* (*1923*), *No. 4–5, pp. 262–390, pl. 1*).—This account includes a list of 79 references to the literature.

On Dictophyme renalis [trans. title], A. Lutz (*Compt. Rend. Soc. Biol.* [*Paris*], *90* (*1924*), *No. 10, p. 696*).—The author presents brief notes on this parasite, better known as *Eustrongylus gigas*, which commonly infests *Grison vittatus* in Brazil.

Agglutinins for Bacterium pullorum in hens' eggs, F. R. BEAUDETTE (*Jour. Immunol., 8 (1923), No. 6, pp. 493–499*).—In work reported from the Kansas Experiment Station it has been demonstrated that the albumin of eggs from hens infected with *B. pullorum* contains agglutinins specific for this antigen. The agglutination is most marked at a 1:8 dilution of the egg albumin, but in some cases complete agglutination takes place in a 1:64 dilution. No correlation was found between serum and albumin titer.

Avian typhoid in Algeria [trans. title], A. DONATIEN, E. PLANTUREUX, and F. LESTOQUARD (*Rev. Gén. Méd. Vét., 33 (1924), No. 386, pp. 65–83, figs. 6*).—This is an account of studies conducted at the Pasteur Institute of Algeria in connection with an extensive epidemic of avian typhoid. The epidemiology, clinical symptoms, pathological findings, and diagnostic features of the disease are described, and the results are reported of bacteriological and immunological studies.

The disease affected adult fowls to the greatest extent and with high mortality. The kidneys, spleen, and intestines alone showed lesions of a septicemic nature. The organism isolated, *Bacterium gallinarum*, resembled *Bacillus paratyphosus* A and B, but differed from both in certain particulars. The disease was easily reproduced in fowls by ingestion of the virulent organs. The organism was toxic for rabbits and guinea pigs, and mice were successfully vaccinated by the ingestion of living cultures.

The only means of controlling the disease is found to be preventive inoculation. The vaccine which gave the best results was a mixed vaccine prepared from 12 different strains of *B. gallinarum*. This vaccine was heated for an hour at 60° C. and treated with 0.5 per cent phenol before distribution. One cc. of the vaccine contained about 3 mg. of the organism in the moist state. The dose for fowls and adult turkeys was 1 cc. and for chicks from 1 to 3 months of age 0.5 cc. The inoculation was given subcutaneously. The fall is considered to be the best time for vaccination, which must be repeated every year.

A survey of poultry diseases in Los Baños, F. M. FRONDA (*Philippine Agr., 12 (1923), No. 5, pp. 191–202*).—This is a summary of information on the affections of poultry observed by the author in Los Baños.

RURAL ENGINEERING.

Variation in annual run-off in the Rocky Mountain region, R. FOLLANSBEE (*U. S. Geol. Survey Water-Supply Paper 520–A (1923), pp. II+14, pls. 2, figs. 2*).—Data are presented which show that the variation in annual run-off differs in different areas in the Rocky Mountain region owing to the differences in the sources of the precipitation on these areas. Except in the drainage basins of streams in northern Montana the year of lowest run-off shown by the records was 1902, when the run-off at one station was only 36 per cent of the mean run-off for the periods covered by the several records available.

The percentage variation of run-off for streams in different parts of Colorado is less for any one year than that for streams in the mountain region as a whole, and the annual variation is markedly similar for streams in the same major drainage basin. The influence of topography upon variation in annual run-off for streams in Colorado is marked. The streams that rise in the central mountain region have a smaller range in variation than those that rise on the eastern or western edges of the central mountain mass. The streams that rise on the plains just east of the mountains have a greater variation than those of any of the mountain groups.

The ratio of any 10-year mean to the mean for the entire period covered by the records ranges from 72 to 133 per cent.

Design and construction of small, concrete-lined canals, W. E. CODE (*Arizona Sta. Bul. 97 (1923), pp. 37, figs. 23*).—Information is presented on the design and construction of small concrete-lined irrigation canals, including tabular data on the hydraulic elements of such canals.

Linings of from 1 to 2 in. in thickness have been used successfully in regions where the frost action is not serious. Present practice tends to make 1.5 in. the minimum thickness, but a greater thickness should be used for large canals and steep side slopes. The slope and thickness should be so designed as to eliminate inside forms, which materially increase the cost. The use of a 2-in. lining on a small canal having a side slope of 2 or 3 to 1 seems to be the limit in that direction. Steeper slopes would require a greater thickness.

Canals located on unstable foundations such as occur in swampy places and on fills require strength to resist side and bottom pressure and unequal settlement. Increased thickness, beam effects, and reinforcing have been found to produce the desired results. On fills especially, the lining should be tight to prevent saturation of the material of the fill.

Concrete-lined canals should be protected from injury by stock. The growth of trees along the bank should be discouraged, since the roots will force their way through cracks in the lining and eventually rupture it. Gopher holes next to the concrete are dangerous in that the foundation is weakened. By far the greatest danger is from the entrance of flood water from the sides, and considerable care should be exercised at all drainage ways to provide ample capacity for all such waters.

The cost of 2-in. concrete lining on two Arizona projects, including the preparation of the earth foundation, the cost of materials, and the placing of the concrete, was found to be 10.5 and 11 cts. per square foot, respectively.

The flow of water through pipe culverts, D. L. YARNELL, S. S. WOODWARD, and F. A. NAGLER (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 1, pp. 19–33, figs. 15*).—A series of tests, conducted by the Bureau of Public Roads in cooperation with the State University of Iowa on the flow of water through short pipes such as culverts, are reported. A total of 1,480 tests were made on concrete, vitrified clay, and corrugated metal pipe culverts flowing partly full and full, with both a free and submerged outlet. The sizes tested of each kind were 12, 18, 24, and 30 in. in diameter. The 24-in. pipe of the three kinds of material were tested in lengths of 24, 30, and 36 ft. to determine the effect of length on flow. Several types of entrance were used to determine their effects in reducing the entrance loss, including all of the standard types approved by the bureau, which consist of the straight end head wall, wing walls set at 45° to the pipe line, and the U-type wing. The effect of varying the height of wing wall was also tested, and a study was made of the flow through pipe culverts without any head walls. The maximum range of head obtained on the culverts varied from 1.05 ft. on the 30-in. clay pipe to 3.29 ft. on the 12-in. clay pipe.

The results showed that the discharging capacity of a pipe culvert depends primarily upon the cross section of the pipe and the difference in water level at the two ends of the culvert. To obtain the maximum discharge, the pipe must be so laid as to insure that its full cross section is filled by the flowing water. If a culvert pipe is so laid that both its upstream and downstream ends are completely submerged, the amount of water which it discharges will be proportional to the square root of the difference in water level at the two ends, and the exact grade at which the culvert pipe is laid will have no effect whatever upon its maximum discharging capacity.

The coefficient of roughness *n* in the Kutter formula was found to range from 0.012 for the 12-in. size to 0.013 for the 30-in. size of concrete pipe, from 0.01 for the 12-in. size to 0.013 for the 30-in. size of vitrified clay pipe, and from 0.019 for the 12-in. size to 0.023 for the 30-in. size of corrugated metal pipe.

The effect of the length of the culvert on the discharge was not as great with concrete and vitrified clay pipe as with corrugated metal pipe. The 45° wing walls increased the capacity of a corrugated metal pipe culvert from 1 to 10 per cent over that obtained in a metal pipe culvert with a straight end wall, and were more efficient when set flush with the edge of the pipe than when set 6 in. back from the edge of the pipe. They were also more efficient when built full height to the top of the head wall than when constructed standard height. When used in connection with a vitrified clay pipe culvert the 45° wing walls were not so effective as the straight end wall entrance with the regular bell end upstream. The U-type wings were also not so effective as the straight end wall for a vitrified clay pipe culvert. The beveled lip end at the entrance of a concrete pipe culvert was found to be of great aid in reducing the entrance loss, especially in the larger sizes. The same was true of the bell end at the entrance of vitrified clay pipe, especially in the smaller sizes. The capacity of a 24-in. vitrified clay pipe culvert could be increased approximately 13 per cent by merely rounding the entrance.

The new discharge formulas derived from the experimental data, including factors corresponding to the losses due to friction, entrance, and velocity head for culverts 30.6 ft. long with straight end wall entrances, are as follows: Concrete pipe with beveled lip end upstream, $Q=4.61\ D^{2.18}\ H^{0.50}$; concrete pipe with square cornered entrance, $Q=4.40\ D^{2.00}\ H^{0.50}$; vitrified clay pipe with bell end upstream, $Q=5.07\ D^{2.05}\ H^{0.50}$; and corrugated metal pipe, $Q=3.10\ D^{2.31}\ H^{0.50}$.

Research work on semigravel, top soil, and sand clay, and other road materials in Georgia, C. M. STRAHAN (*Ga. Univ. Bul. 326 (1922), pp. 35*).—Field and laboratory data on the use of semigravel, top soil, sand clay, and other road materials for road construction are reported and discussed, with particular reference to the highway requirements of Georgia. Data on laboratory procedure are appended.

Researches on the structural design of highways by the United States Bureau of Public Roads, A. T. GOLDBECK (*Amer. Soc. Civ. Engin. Proc., 50 (1924), No. 4, [pt. 3] pp. 453–489, figs. 26*).—In a contribution from the U. S. D. A. Bureau of Public Roads a brief summary is given of those phases of research being conducted which are concerned with the structural features of highway design. These are considered under researches on (1) the subgrade, (2) loads on pavement, (3) stresses in concrete pavements, and (4) materials. Miscellaneous investigations are described, and some of the data from the Pittburg, Calif., test road are included.

In studies of loads on pavements, it has been found that impact depends largely upon the kind and condition of the tire. Thin or worn solid rubber tires, even though they be wide, produce high impact forces. Pneumatic tires offer the greatest aid in reducing impact forces, the impact increasing only slightly with the speed of the truck. Cushion tires offer corresponding advantages in reducing impact. Impact has been found to increase with the speed of the truck, but not according to any constant ratio or power of the speed. Although heavy unsprung weight may give higher impact than lighter unsprung weight, it is not considered to be the major controlling factor. Impact may be as high as seven times the static load on one rear wheel when a solid-tired truck strikes a 1-in. obstruction at 16 miles per hour, an average value being about four times. For pneumatic tires the maximum impact value is probably not more than 1.75 times the load on one rear wheel and an average value is not more than 1.25 times this load. All cushion wheels do not reduce impact on the road surface even though they may cushion the vehicle.

The studies on stresses in concrete pavements have shown that the resistance of a road slab depends in part on the supporting value of the subgrade. A subgrade of high supporting value materially increases the resistance to impact. The resistance of rigid slabs to impact varies as some power of the depth less than two. In general, plain concrete slabs show no more resistance to impact delivered at the edge than to impact delivered at the corner. Transverse cracks and longitudinal cracks near the sides of a slab may be caused by impacts delivered at the edge of the slab. Plain concrete of 1:3:6 mix shows from about 60 to 80 per cent of the resistance to impact of plain concrete of 1:1.5:3 mix. The lean mix also shows more variation in strength. Reinforcing steel when present in sufficient quantity in concrete slabs, and when so placed as to receive tensile stress, adds to the resistance of the slab to impact. After a crack occurs, small rods closely spaced seem to be more effective than the same percentage of steel in large rods widely spaced. There is very little evidence of cushioning due to bituminous tops at temperatures of 32° C. (90° F.) or less. Bituminous tops do not seem to add to the slab strength of a concrete base, with the possible exception of the 4- and 6-in. bases on a dry subgrade.

Public Roads (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 1, pp. 35, figs. 51*).—This number of this periodical contains the following articles:

Connecticut Highway Transportation Survey, by J. G. McKay; The Flow of Water Through Pipe Culverts, by D. L. Yarnell, S. S. Woodward, and F. A. Nagler (see page 287); and Road Material Tests and Inspection News.

Intake-manifold distribution, H. W. Asire (*Jour. Soc. Automotive Engin., 14 (1924), No. 4, pp. 387–395, figs. 22*).—Studies on the nature of the distribution of gases to the cylinders of internal-combustion engines and on the comparative effectiveness of different types of manifold are reported.

It is shown that because of the low volatility of commercial fuels heat must be applied if distribution in the gaseous state is to be attained. If the fuel is not vaporized by hot spots or other preheating devices, about one-half of it must be distributed as liquid at 70° F. At low temperatures nearly all the fuel reaches the cylinder in a liquid state during the warming up periods. If sufficient heat is applied to dry the mixture, the resulting mixture temperatures will be so high that the engine will be sensitive to detonation. If the compression is reduced to eliminate detonation the power and economy are also reduced.

All of the commercial manifolds tested cold exhibited practically no inherent ability to distribute liquid. It was found that the three main factors controlling the flow of air and liquid fuel in a manifold are (1) the stratification of liquid with respect to air, (2) puddles of liquid that are formed in the manifold in dead-air pockets, and (3) the effect of the firing order.

Stratification was found to result from the fact that liquid fuel, which is heavier than air, is carried in the air stream in drops of varying size. Whenever the air stream makes a turn some of the drops of liquid continue in the same direction as formerly. Stratification starts at the first turn, usually at the throttle, and becomes worse at each bend. Puddles that form as a result of stratification and from other causes were found to constitute a source of supply for the first cylinder demanding a charge after that manifold branch has remained inactive during the functioning of another branch.

It is concluded that this could be controlled more readily if air flow could be attained without turbulence. Since the forces involved are large and air is a very light-weight mobile fluid, freak flow was found to result around every sharp bend and every protruding corner. The conventional throttle is one of the main causes of turbulent air flow, which constantly changes its path even though the mechanical adjustments remain unaltered. Under conditions of steady or uniformly pulsing air flow it was found that the puddles in the air pockets remain practically constant in size, but these conditions seldom occur.

Engine cooling systems and radiator operating characteristics, N. S. DIAMANT (*Jour. Soc. Automotive Engin., 14 (1924), No. 4, pp. 396–406, figs. 14*).—In the first part of this paper a general quantitative comparison of air, water, and oil-cooled cylinders is given as it relates to the subjects of heat transfer and temperature drop. In the second part an attempt is made to discuss the performance or operating characteristics of radiators from the point of view of the truck or tractor designer. A large amount of tabular and graphic data is reported.

The data show that the order of magnitude of the heat transferred per square inch of surface per 100° F. temperature difference between the cylinder metal and the cooling medium is about 100 for water, 1 for air, and 10 for oil, depending upon the rate of flow, its turbulence, and other factors. The cooling capacity of radiators increases with the air flow. For radiators having no fins the increase is nearly directly proportional, and doubling the air flow doubles the cooling capacity. For radiators having fins or an indirect cooling surface swept by air on both sides, the cooling capacity does not increase so rapidly as the air velocity.

The amount of air flowing through a radiator traveling in still air depends upon the resistance of the core and the resistance of the remainder of the air circuit under the hood. In general, a propeller or curved-blade type of fan will draw more air through a high resistance core than through a low resistance core. The opposite is true for a disk type of fan.

For engines having pump circulation the cooling capacity of the radiator begins to decrease as the rate of flow begins to fall below 3 gal. per minute per foot of width per inch of thickness of the core.

Data on radiator design and on the conducting of road tests are included.

The simplex lime spreader, H. H. MUSSELMAN (*Michigan Sta. Circ. 62 (1924), pp. 7, figs. 5*).—This lime spreader is described and diagrammatically illustrated. Working drawings and bills of material are also included. This spreader is an improvement of one described in a previous publication (E. S. R., 47, p. 891).

Preliminary tests on the infiltration of air into buildings, F. H. SIBLEY (*Jour. Amer. Soc. Heating and Ventilating Engin., 30 (1924), No. 4, pp. 311–316, fig. 1*).—In a contribution from the University of Nevada the details of operation and the difficulties encountered in tests to determine the infiltration of air into a building are discussed. The theory of the tests was to liberate carbon dioxid in a given room by the action of sulphuric acid on sodium bicarbonate, and to determine the rate of air leakage into the room on the basis of the decrease of carbon dioxid in the air samples analyzed.

Dairy barn and milk house construction, J. P. LAMASTER and W. J. KEEGAN (*Clemson Agr. Col. S. C., Ext. Bul. 62 (1924), pp. 48, fig. 44*).—Suggestions and practical information are given on the planning and construction of simple dairy barns adapted to South Carolina conditions. Working drawings and bills of material are included.

RURAL ECONOMICS AND SOCIOLOGY.

Foundations of agricultural economics, J. A. VENN (*Cambridge, Eng.: Univ. Press, 1923, pp. XV+397, pls. 15, figs. 11*).—A narrative developed from a series of lectures to third year and diploma students at the University of

Cambridge is presented, dealing with the origin and incidence of forms of land tenure, customs of taxation and the collection of tithes, marketing practices and cooperation among agriculturists, small holdings, the wheat supply of the United Kingdom, and the history and statistics of forestry. An account is given of the way in which British agriculture was expanded to meet the demands of the late war. The final chapter gives the history of efforts to compile agricultural statistics and market reports for Great Britain. Appendix 1 contains a note on the law of diminishing returns in agriculture, and appendix 2 some tabulated statistics.

The economics of a food supply, W. O. HEDRICK (*New York and London: D. Appleton & Co., 1924, pp. XIII+336, pls. 2, figs. 7*).—This treatise is designed to give due weight to the physical and biological sources of our food supply, but the emphasis is placed upon the methods by which natural resources are converted into food. Thus the bearing upon food production of farming and farm management and marketing or distribution is given 6 of the 13 chapters. The discussion of marketing covers market facilities and technique, the functions of middlemen, and the trades, notably the grain and flour, meat and livestock, produce, and milk trades, which are presented in detail. A chapter is given to the question of food prices and price making and one to food abuses and pure food. It is demonstrated finally how the rise in the cost of living and the stress of the World War have led the Government to give more attention to the food supply, particularly in the way of experimenting with food distribution.

First steps in farming, A. AGEE (*New York and London: Harper & Bros., 1923, pp. [3]+193, pls. 4*).—Suggestions of a general nature are offered to men and women who desire to become farmers. The discussion covers the selection of the farm, crop rotations and the use of legumes, pastures and the improvement of livestock, conservation of moisture, tillage, the use of commercial fertilizers, and other practical suggestions.

Costs and farm practices in producing potatoes on 461 farms in Minnesota, Wisconsin, Michigan, New York, and Maine for the crop year 1919, W. C. FUNK (*U. S. Dept. Agr. Bul. 1188 (1924), pp. 40, figs. 7*).—General statistical data are presented, and yields, cost of production, and freight rates are briefly reviewed as contributing to the localization of surplus production of potatoes. Detailed costs and farm practices involved in potato production in nine different areas in 1919 are then presented in order to point out the variations in the factors affecting the cost of production in different parts of the country. The areas studied are located in Clay and Anoka Counties, Minn.; Barron and Waupaca Counties, Wis.; Grand Traverse and Montcalm Counties, Mich.; Monroe and Steuben Counties, N. Y.; and Aroostook County, Me.

Of the crop acreage devoted to different crops in 1919 on the farms studied, an average of 16 per cent was devoted to potatoes, and for the several regions this percentage varied from 12 in Grand Traverse County, Mich., to 28 in Aroostook County, Me. A fairly definite rotation of crops is followed in all the areas except in Clay County, Minn., where wheat, oats, and potatoes are the most important crops grown, but do not occur in any definite successions. Potatoes constituted the most important source of income in each area. In the Maine area 94.5 per cent was derived from this source, and the range was from 41.5 in Barron County, Wis., to 64.8 in Grand Traverse County, Mich.

The total cost per acre ranged from $78.09 in Clay County, Minn., to $219.60 in Aroostook County, Me., and that per bushel from 68 cts. in Steuben County, N. Y., to $1.06 in Monroe County, N. Y. Not including a land charge, the lowest cost per acre amounted to $69.70 in Clay County, Minn., while the highest was $208.67 in Aroostook County, Me. The cost per bushel was lowest in Barron and Waupaca Counties, Wis., where it was 64 cts., and highest in Monroe County, N. Y., at 96 cts.

The amounts of labor and material used per acre, the average cost per acre and per bushel, and the variation in costs per acre on 461 farms in 1919 are tabulated. Man and horse labor was the most important item of cost in all areas with the exception of Aroostook County, Me., where the fertilizer cost was greater than the combined costs of man and horse labor. A detailed analysis is given of items of cost, including labor, materials, the use of land, machinery, overhead expenses, and other costs such as taxes and insurance, bags and barrels, storage charges, and loss on abandoned potato acreage. The items of share-rent arrangements and the trend of costs and prices, 1913 to 1921, inclusive, are briefly set forth.

Cost of producing winter wheat in central Great Plains region of the United States, R. S. WASHBURN (*U. S. Dept. Agr. Bul. 1198* (*1924*), *pp. 36, figs. 11*).—A study of basic cost requirements, as well as acre and bushel costs for the crop year 1920, is presented here, the data having been obtained through personal visits to representative wheat growers in 10 counties of Missouri, Kansas, Nebraska, and Oklahoma where from 50 to 85 per cent of the total crop consisted of winter wheat. The cost items considered are labor and power, materials, and other costs.

The average acre cost of each item of expense is a weighted average computed by dividing the total cost of each item by the total harvested wheat acreage. An analysis of the total operating expense by counties for all winter wheat produced on owned land shows that labor constitutes about 42 per cent, materials 14, threshing 13, and other costs 31 per cent of the total operating expense. The average net operating expense was $1.25 per bushel, varying from an average of $0.90 in Thomas County, Kans., to that of $1.96 in Woodward County, Okla. With interest on equipment and land included, the average net cost per bushel was $1.80 with a variation of from $1.26 in Thomas County, Kans., to $2.57 in Clay County, Nebr. The operating expense per acre to tenant operators was relatively lower than to owner operators, although, on the other hand, the operating expense per bushel was relatively higher to tenants than to owners. In all except two counties the expense for labor was slightly greater for tenant than for owner operators. For all tenant farms the average net cost per bushel was $1.83 as compared with a net cost per bushel of $1.80 on owned farms.

The expense per acre for labor in the regions having the highest land values was about 50 per cent greater than in the regions with the lowest land values. The farm with the lowest cost was in Woodward County, Okla., and had a very low labor expense and a low charge for interest on investment. On the other hand, the highest cost was found in Pike County, Mo., on a farm which had a relatively high expense for fertilizer, interest on investment, and an abandoned acreage charge for over half of the seeded acreage.

The array of farms with respect to variation in net cost per bushed by counties exhibits the fact that 58 per cent of all farms were in the $1 to $2 group, 33 per cent in the $2 to $3 group, and 8 per cent in the $3 to $4 group. Of the total acreage, 66 per cent was in the $1 to $2 group, 26 per cent in the $2 to $3 group, and 4 per cent in the $3 to $4 group. Of the total production 97 per cent was in the two lowest cost groups.

The yields for the owner operators having costs of $1.20 or under per bushel ranged from 12 to 31 bu. per acre, while those having a cost of $4 or more per bushel had yields which ranged from slightly less that 3 to 7 bu. per acre. The yields for tenant operators in similar cost groups ranged, respectively, from 12 to 25 bu. and from 3 to 7 bu. per acre. A comparison of the cumulative percentage of harvested acreage and the cumulative percentage of production indicates that 49 per cent of the total harvested acreage and 35 per cent of the total production was on farms having yields of less than the average yield per acre. A summary of labor practices in 1920 is given for each of the winter wheat areas studied.

A study of the farm business of the Lewes community, M. O. PENCE (*Del. Univ. Agr. Ext. Bul. 9 (1923), pp. 30, figs. 12*).—A complete farm business analysis was made of 86 farms in the Lewes community in Lewes, Rehoboth, and Broadkiln Hundreds, Del., the extension service, teachers of vocational agriculture, and the Bureau of Agricultural Economics, U. S. D. A., cooperating. Additional information with regard to the production of crops, feeding and management of poultry and livestock, and transportation and market conditions was secured by means of questionnaires from 92 farms.

The volume of business on two-thirds of the total number of farms was found to be too small. The total sale of dairy products on 56 farms, or 75 per cent of the total, averaged under $200, and of the other 19 farms only 10 sold more than $300 worth. Poultry led all other livestock in returns with a total of $18,740, as compared with sales of dairy cattle and dairy products amounting to $18,654. One farm in 7 reported total receipts from poultry of $400 or over, and one-third of the remainder $200 or over. A standard rotation of corn, wheat, and clover, varied with the introduction of tomatoes and potatoes as market conditions warrant it, was found to be the rule.

Suggestions are offered for increasing crop yields and acre returns, the use of labor, marketing farm products, and keeping simple farm accounts.

Preliminary report on the business of farming in the South Dakota wheat belt, M. R. BENEDICT (*S. Dak. Dept. Agr. Circ. 6 (1923), pp. [1]+25*).—A study of the business of approximately 60 farms in the wheat growing sections of Brown and Spink Counties, S. Dak., was made covering the years 1921 and 1922. A preliminary report is presented here in mimeograph form.

The share renting of farms in the United States, H. A. TURNER (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 4, pp. 500–542*).—The information given here is taken from the census of 1920. It sets forth briefly the regions where share renting is preferred to cash renting, changes in the relative importance of share renting between 1910 and 1920, the principles underlying share contracts on farms, and the differences in share rental practice in widely separated parts of the United States. In this connection five counties, two in which cotton growing predominates, two devoted largely to the production of grain, and one dairy county, have been selected for a discussion of details. Furthermore, the customary share renting practices commonly associated with certain crops, including maize, wheat and other small grains, hay, cotton, tobacco, and potatoes and other truck crops are considered. Other data summarized show the extent to which rented farms of different types are worked on shares, the size of share rented farms, and personal characteristics of share tenants. A bibliography of 27 titles is added.

Farm rental terms, H. E. SELBY (*Montana Sta. Circ. 119 (1923), pp. 16*).—The author describes some common renting systems and terms, particularly those found in Montana. The most common system there is share renting, in which the tenant pays the landlord a fixed share of the crops, as one-third or one-half. The more elaborate system of partnership share renting is employed chiefly for the carrying on of livestock farming. He discusses in some detail the items of farm receipts and expenses as a basis for estimating the farm income and its division between landlord and tenant. Estimates obtained in a farm management survey on an actual Montana dry-land farm, which typify a rather simple renting arrangement, are used as illustration in this connection. A similar statement for a partnership share renting arrangement on an actual Gallatin Valley irrigated farm is given, illustrating the division of farm income under more complicated renting terms. A sample farm lease form is included.

The land systems of Mexico, G. McC. McBride (*Amer. Geogr. Soc., Research Ser. No. 12 (1923), pp. XII+204, pls. 18, figs. 12*).—The history of systems of land tenure in Mexico is presented in considerable detail, and various environmental and physical and geographical influences are traced, as well as the manifestations of social and political institutions upon methods of landholding. The haciendas, ranchos, and collective holdings are the particular types described.

Statistics are given indicating the distribution of rural holdings in Mexico. The agrarian revolution started by Madero and present reform measures are said to be bringing about a somewhat more orderly and systematized distribution of the land, more small holdings are being created, and some land has been secured for distribution among agricultural villages on the old plan of communal holdings. Certain States have issued laws under the national constitution of 1917 that are designed to break up the large estates, and a national agrarian law is now under discussion.

Communal tenure is said to be the form best understood by the agricultural Indians, and the cultivation of common lands seems to be the method best suited to the needs of this element of the population. The Mexican hacendados, the numerous Spanish owners of large estates, and Americans who, under the Diaz administration, acquired extensive holdings for development, colonization, and speculation are opposing the efforts at reform.

An extensive bibliography presents the source material relating to the preconquest period, the colonial period, general collections of land laws, and to sections of the national period, 1821–1876 and 1876–1921. Laws and Government department publications are also listed.

The land question solved, R. Murray (*London: Labor Pub. Co., Ltd., 1922, pp. 61*).—In presenting the case for land nationalization in England, suggestions are made to the end of decreasing the rent of land by 10 per cent, and compensation by the Government is proposed in the form of a uniform rate of 50 years' use of the land from the date of purchase to be granted to the purchaser free of rent. It is held that the operation of a nationalization act containing such provisions should be retrospective for a certain number of years, and that the confiscation should not be applied to buildings and other products of human labor on the land.

Latifundia in Sicily and their possible transformation, G. Lorenzoni (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 3, pp. 316–349*).—A general survey of the geographic and topographic characteristics of Sicily is followed by a discussion of the system of latifundia and the elements that may be expected to contribute to its progressive transformation. The latifundium as a landholding institution typical of the interior of the island is said to be based upon the absolute predominance of extensive cereal cultivation alternating with pasture, single management, and an area of a certain size. Statistics are cited showing the extent of this system. Drought, malaria, soil conditions, and social and economic factors are held to be the causes for its predominance. State intervention is said to be one of the first conditions essential to its complete modification.

The problem of increasing the area of land under cultivation in Japan, G. Perris (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 4, pp. 470–499, pl. 1*).—Japanese society before 645 A. D. is said to have been fundamentally patriarchal, but at that time the Chinese theory that land ownership is vested in the emperor was adopted. In the course of a little more than three centuries all the land passed into the hands of fief holders. Between 1868 and 1912 important land reforms were carried out, and a complicated land-tenure system with minute subdivisions has grown up. Measures are now being taken to increase the area and the productivity of lands under cultivation.

The administration of land improvement and redistribution schemes, laws, and measures for the encouragement of land improvement are reviewed, as are also specialized and technical instruction and financial arrangements. Continuous progress is noted, citing statistics.

Conditions affecting the demand for harvest labor in the wheat belt, D. D. LESCOHIER (*U. S. Dept. Agr. Bul. 1230* (*1924*), *pp. 46, figs. 12*).—Data are presented in this bulletin for the purpose of testing the accuracy of the Kansas formula for estimating the amounts of labor needed in the wheat States for the harvest. This formula was presented and discussed in an earlier bulletin (E. S. R., 47, p. 192). The facts cited here were obtained by two groups of investigators visiting farmers and threshermen in Oklahoma, Kansas, Nebraska, North and South Dakota, and Minnesota during the harvest and threshing season of 1921. The returns were supplemented and checked by still another worker, who interviewed Federal, State, and county agricultural and employment office officials.

A table was prepared to show the labor resident on 1,289 wheat farms, as well as the hired labor and the amount of labor used at harvest time per 100 acres of wheat and per 100 acres of small grain harvested. It is indicated that the farmer's family furnished barely 40 per cent of the total harvest force, and the larger the farm the smaller the amount of family labor per 100 acres harvested. The table also shows that the number of year hands and crop-season hands resident on the farms during the harvest was small, particularly in Oklahoma and Kansas. No labor was hired on 346 farms, over half of which exceeded 240 acres in size, 47 exceeding 480 acres.

The variations in amounts of labor used in parts of Nebraska, the Dakotas, and Minnesota are largely to be explained in terms of variations in the amount of small grain acreage per farm and of variations in the extent of crop diversification. A table shows that 26.3 per cent of all the farms visited harvested for more than 14 days and that 11.5 per cent extended the harvesting for from 19 to 30 days. Very few farms of less than 480 acres harvested more than 18 days. On farms of smaller size the duration of the harvest increases with the size of the farm. On farms of 160 acres or less the harvest is usually finished in 8 or 9 days, of 240 acres in 9 or 10 days, of 320 acres in 11 or 12 days, while farms of 880 acres require from 15 to 18 days. The significance of the facts presented in this connection is said to be that the big demand for harvest labor in a county is necessarily concentrated into a period of 2 to 4 weeks, generally 2 to 3 weeks; the demand for labor varies directly with the size of the farms; and if a majority of the farms in a county are large farms the intensity of the demand in that county will be greater.

It is strikingly exhibited that the total amount of labor used per 100 acres cut does not seem to differ materially in areas where the binder predominates from amounts where the header is commonly used, and that there seems to be a striking variation in the amounts of labor used in different areas using the same machinery. The facts for North Dakota where the binder is used exclusively are compared and correlated for those of Kansas where the use of the header predominates. The percentage of hired labor working in the harvest was 4.6 per cent larger in North Dakota, but that of harvest hands employed was 14.1 per cent smaller. In other words, the farms in Kansas use a larger percentage of labor during the harvest season and solely for harvest work.

Climatic conditions are discussed as additional factors affecting the amount of labor required in harvest. Certain adaptations and modifications of the Kansas formula are set forth, and data showing the labor required for threshing are displayed.

The means employed by 1,091 farmers to obtain harvest hands are shown, as well as the number of men who were definitely directed to harvest jobs by the employment offices in 1921. The number of hours worked in harvesting and threshing are tabulated, and the average wages paid with board are shown by counties on maps of the States concerned. The appendix consists of four detailed tables.

Commercial harvesting, grading, and marketing of asparagus in South Carolina, F. L. HARKEY and C. A. OWENS (*Clemson Agr. Col. S. C., Ext. Bul. 61 (1924), pp. 15, figs. 12*).—This discusses the harvesting, grading, packing, and loading methods employed by the older growers of this crop.

Report on the grain trade of Canada, 1922, W. DOUGAN (*Canada Bur. Statis., Rpt. Grain Trade Canada, 1922, pp. 205, pl. 1, figs. 8*).—The present report follows a similar one for the earlier year previously noted (E. S. R., 47, p. 493). Tables have been added showing freight rates for transporting grain, other tables have been enlarged, and comparative figures have been included where possible.

Grade and standardization laws of the United States and Canada (*Rochester, N. Y.: Internatl. Apple Shippers' Assoc., [1924], pp. 206*).—A presentation of all important laws relating to grades, marks, packing, packages, standards, and the Food and Drugs Act, together with opinions, decisions, special notes, departmental regulations, etc.

Cooperative marketing, the golden rule in agriculture, H. STEEN (*Garden City, N. Y.: Doubleday, Page & Co., 1923, pp. X+366*).—The beginnings, development, and operation of over 100 cooperative marketing associations in the United States dealing in agricultural products are narrated in these pages. Several leading organizations in Canada are also included. The stories are given of Burley tobacco marketing and the activities of the raisin growers in California, California citrus fruit producers, apple growers, and producers of small fruits, cotton, livestock, wool, eggs, butter and cheese, milk, grain, potatoes, rice, beans, seeds, and nuts in the various sections of the United States. The later chapters are devoted to setting forth the organization and business policies that contribute to success.

The cooperative sale of livestock in Germany, A. BRENNING (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 4, pp. 453–462*).—This is a general discussion of the regulations of and instructions to cooperative societies and their members, also of types of sale, war control, the growth of cooperative marketing and its relation to the ordinary trade, and propaganda necessary for future development.

The central cooperative banks of the rural and agricultural cooperative societies in Germany, K. HILDEBRAND (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 3, pp. 350–374*).—The function of the cooperative central banks is to assist individual cooperative societies, principally by establishing and maintaining the relation between the societies and the money market. Legal and administrative problems are discussed.

The cooperative purchase of agricultural requisites in Norway, H. OVERAAE (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 4, pp. 463–469*).—Cooperative purchasing of agricultural requisites dates from 1896 with the establishment of an agricultural consortium for joint purchasing at Christiania. The course of the development up to 1921 of societies of this type is outlined.

Law for the American farmer, J. B. GREEN (*New York: Macmillan Co., 1923, new and enl. ed., pp. XVIII+493*).—Later decisions and those relating to railroads, highways, and electric lines through and along the borders of farms are added in this revision of a volume noted earlier (E. S. R., 26, p. 93). Further additional chapters deal with the subjects of automobile traffic and cooperative marketing.

The country life movement in the United States, C. J. GALPIN (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 3, pp. 295–315; also in Sci. Agr., 4 (1923), Nos. 3, pp. 109–111; 4, pp. 132–138; 4 (1924), No. 5, pp. 165–168*).—The author describes American frontier rural organization, defines the rural social problems of to-day, notes the rise of rural sociology, lists country life literature, and cites systematic research in the field of rural social life.

Rural Texas, W. B. BIZZELL (*New York: Macmillan Co., 1924, pp. XVI+477, pls. 13, figs. 10*).—This volume constitutes an analysis of the agricultural resourses and rural living conditions in Texas. Early chapters are given to the physical, climatic, and historical background for agriculture and land utilization and the livestock industries of the State. Transportation and rural communication, rural manufactures, agricultural finance and marketing, agricultural organizations and fairs, governmental work for country life, rural education, and human factors and rural living conditions are set forth. The final chapter deals with the agricultural outlook in Texas. Statistics are presented in eight appendixes.

The series to which this belongs was noted earlier (E. S. R., 45, p. 291).

Agricultural conditions in Esthonia, compiled by E. VESTERINEN (*Helsingfors: Tietosanakirja-Osakeyhtiö, 1922, pp. 64, figs. 30*).—This is a short survey of the present state of development of agriculture in Esthonia, giving attention also to agricultural education, cooperation, and land reform.

Notes with reference to Polish agriculture [trans. title], H. HITIER (*Jour. Agr. Prat., n. ser., 40 (1923), Nos. 44, pp. 349–352, figs. 4; 45 pp. 373–377, pl. 1, figs. 2; 47, pp. 411–415, figs. 3*).—Several large farming estates in Poland are described from the point of view of French visitors, who were members of a mission studying agricultural conditions in Poland in June, 1923.

The rural economy of the community of Acquacanina in the high Apennines [trans. title], P. CARLONI (*Ann. R. Ist. Super. Forestale Naz. Firenze, 8 (1922–23), pp. 103–171, pls. 2*).—A general survey of a mountainous section in the Province of Macerata in central Italy is presented under three principal heads, the land, population, and markets; the condition of the land and of industries; and a résumé of the economic effects of agrarian regulations.

Impressions of agriculture in Cyrenaica [trans. title], G. DALMASSO (*Italia Agr., 61 (1924), No. 2, pp. 73–88, figs. 20*).—The primitive agricultural practices of the native Bedouins of this region, who cultivate chiefly barley, grapes, and olives, are described in these pages, and the opportunity for future development along lines of vine growing is stressed.

The agricultural outlook for 1924 (*U. S. Dept. Agr., Misc. Circ. 23 (1924), pp. [2]+22*).—This statement presents farmers' intentions to plant in 1924 as reported to the Department between February 15 and March 1 and summarized by the Crop Reporting Board of the Department on the basis of returns from over 43,000 producers. A review of the general situation, prepared by the staff of the Bureau of Agricultural Economics, is included. Tendencies toward improvement or an increase in production are noted in regard to wheat, corn, peanuts, sweet potatoes, feed crops, and flax, while the swine, dairy cattle, lamb, pork, and wool industries are either stationary or decreasing somewhat. Domestic and foreign demand, farm credits, and labor are briefly reviewed, as is also the situation in specific major lines of production.

Detailed statistics of the trade and commerce of the City of Chicago in flour, grain, provisions, livestock, seeds, hides, wool, lumber, etc., with the daily current prices of the leading speculative products for the year 1923 (*Chicago Bd. Trade Ann. Rpt. 66 (1923), pp. 1–155*).—Tabulations are submitted showing receipts, shipments, and prices. Data are also presented showing the lake commerce in Chicago, and summaries of grain crops, livestock, exports, visible supply of grain, and other items for the United States and for specified foreign countries.

Statistical notes on agriculture in the Irish Free State, E. A. M. Morris (*[Ireland] Dept. Agr. and Tech. Instr. Jour., 23 (1924), No. 4, pp. 341–343*).—Recent statistics relating to population, area under crops, livestock, and agricultural prices are summarized.

General results of an agricultural census in Finland, 1920.—Agriculture and livestock [trans. title], O. Groundstroem (*Finlands Off. Statis., Lanthushållning, 1920, III, No. 17, pp. [104]*).—The returns of a census of agriculture and livestock in Finland are reported. Copies of the forms of the questionnaires used are reproduced, and the data are tabulated.

[Agricultural and livestock statistics for Finland] (*Statis. Årsbok Finland, n. ser., 20 (1922), pp. 76–94; 21 (1923), pp. 76–98*).—Statistics of crops, livestock, and forests for 1922 and 1923 bring to date the series of reports noted earlier (E. S. R., 47, p. 395).

[Agricultural statistics for the Dutch Colonies, 1921] (*Jaarc. Koninkr. Nederlanden, Koloniën, 1921, pp. 61–70*).—Tabulated statistics are given, continuing the annual reports previously noted (E. S. R., 48, p. 496).

Estimates of the quantities of the principal vegetable foodstuffs available for consumption in Java and Madura during the period 1919 to 1922 [trans. title] (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Statis. Kant. No. 13 (1924), pp. 17, pls. 2*).—The statistics are tabulated, discussed, and illustrated graphically.

AGRICULTURAL EDUCATION.

The progress of education in forestry in the United States, R. S. Hosmer (*Empire Forestry Jour. [London], 2 (1923), No. 1 pp. 83–106*).—The purpose of this paper is to summarize certain of the problems that American foresters have met in training men for the profession. The foundation of the school of forestry at Cornell University in 1898 and of the one at Yale in 1900 is briefly recounted, and other established schools or departments of forestry are enumerated.

A standardized curriculum in forestry was worked out in 1911, and was revised by the Second National Conference on Education in Forestry at New Haven, Conn., in 1920. This curriculum requiring five college years of 32 weeks each is presented. The three subject groups of economics, business, and technique were given, respectively, 25, 25, and 50 per cent of the credit hours. This was a notable increase in the emphasis put on the theory and practice of forestry economics, and the present trend is shown to be toward utilization, management, and a wider knowledge of economics, although it is realized that silviculture must always be the backbone of management. The education of research workers in forestry and professional organization is briefly noted.

The subsection on agricultural education [trans. title] (In *XIe Congrès International d'Agriculture, 1923. Tome II, Compte Rendu des Travaux. Paris: Libr. Agr. Maison Rustique, 1923, pp. 192–228*).—Minutes of the sessions and discussions of the papers read before this section of the Eleventh International Congress of Agriculture are presented. The following papers are published: The Results of the International Home Economics Conference at Paris in 1922, by De Robien; The Union of Proprietors and Women Farm Workers in Poland, by Jankowska; Elementary Agricultural Education in the Netherlands, by K.-H.-M. Van der Zande; The Rural Home, by Imbart de la Tour; and Women's Institutes in Canada, by R. Watt.

Agricultural education [in India] (*India [Dept. Agr.] Rev. Agr. Oper., 1922–23, pp. 77–84, pl. 1*).—The progress of agricultural teaching at the several agricultural colleges of India as well as at agricultural schools and by means of short courses in 1922–23 is briefly reviewed.

The education of the farm boy, J. M. Trueman (*Sci. Agr., 4 (1924), No. 9, pp. 275–277*).—A practical course consisting of two 3-month periods given from January to April in two separate years is to be inaugurated at the Nova Scotia Agricultural College, beginning January 1, 1925. The subjects to be taught will be selected from a list including soils and fertilizers, crops, poultry and animal husbandry, dairying, economic entomology, horticulture, olericulture, farm mechanics, business methods, agricultural societies, and music.

The place of the extension school in the agricultural education system, W. H. Brittain (*Sci. Agr., 4 (1924), No. 9, pp. 278–281*).—A plan for extension courses and supervised practice on the farm is suggested, which may be linked up with the course described above. The possibility is discussed also of making arrangements whereby students after taking the farm course may enter the second year of the regular or degree course.

Extension workers' handbook of agricultural information (*State College: Penn. State Col., Dept. Agr. Ext., 1922, pp. [171], fig. 1*).—This is a compilation of information on general and agricultural subjects for the use of extension workers in Pennsylvania.

Agricultural commerce, G. G. Huebner (*New York and London: D. Appleton & Co., 1924, new ed., rev. and enl., pp. XVI+529, figs. [54]*).—This is a revision of a textbook noted in the first edition (E. S. R., 34, p. 595). Chapters are added dealing with the trade in dairy products and cooperative marketing of farm products, and new sections have been inserted in most of the chapters as originally written.

Economic geography, R. H. Whitbeck and V. C. Finch (*New York and London: McGraw-Hill Book Co., Inc., 1924, pp. X+558, figs. 331*).—This book is divided into two parts, chapters 1 to 18, inclusive, treating of the United States and Canada and chapters 19 to 36 of the rest of the world. The production of agricultural commodities and mineral and other materials for industry is treated in detail, showing the influences of geographic factors upon agriculture, industry, and commerce and upon the life of man. Numerous maps, graphs, and photographs illustrate the text.

The story of the oak tree, Mrs. E. Brown (*Easton, Penn.: Chem. Pub. Co.; London: Williams & Norgate, 1924, pp. [4]+127, pl. 1, figs. 30*).—This is a nature study reader about the life history of the oak tree, bringing in incidentally a description of the cell structure of all living matter and the interdependence among different forms of life.

MISCELLANEOUS.

Guide to station buildings and fields (*New York State Sta. Circ. 68 [1923], pp. 4, figs. 3*).—This circular contains a plan of the station farm, showing the location of the various fields and the experiments under way in each field. A guide to the buildings is also given.

Monthly Bulletin of the Ohio Agricultural Experiment Station (*Ohio Sta. Mo. Bul., 9 (1924), No. 1–2, pp. 32, figs. 18*).—This number contains seven articles abstracted elsewhere in this issue.

NOTES.

Alabama College and Station.—Work is under way on the first unit of the new poultry plant. An incubator house 28 by 50 ft. and housing incubators sufficient for 50,000 eggs and 100 poultry pens each 50 by 20 ft. are being constructed.

Delaware Station.—L. W. Tarr has resigned as chemist, effective September 1, in order to establish and direct a research laboratory for a commercial concern in Newark.

North Carolina College.—I. O. Schaub, in charge of the southern division, Office of Cooperative Extension Work, U. S. Department of Agriculture, resigned June 30 to accept the directorship of the agricultural extension service.

Ohio State University.—Frederick W. Ives, professor of agricultural engineering since 1918, died July 5, following injuries received in a train wreck June 30, while returning from a meeting of the American Society of Agricultural Engineers, of which he was president.

Professor Ives was born in Rubicon, Wis., November 20, 1884, was graduated from the University of Wisconsin in 1909, and served the following year there as instructor in drawing. Since 1910 he had been associated with engineering work at Ohio State University and had been designated as the university architect. He was widely known in agricultural engineering circles and was the author of several textbooks on the design of barn structures and other shorter publications.

Oregon College and Station.—A. L. Lovett, professor of entomology and station entomologist, died April 25, aged 38 years. Professor Lovett was a graduate of the Oklahoma College in 1908 and served as State nursery inspector and assistant in entomology in the Oklahoma College and Station until 1911, when he came to Oregon as research assistant in the college and station. He had made a special study of insecticides and spray solutions, including the use of spreader and sprays, which has proved of wide application and benefit.

Pennsylvania College.—Dr. Edwin E. Sparks, president from 1908 to 1920, and subsequently a special lecturer in American history, died at State College, June 15, at the age of 64 years.

Doctor Sparks was a native of Ohio and was graduated from the Ohio State University in 1884. He subsequently received the M. A. degree from the same institution in 1890, that of Ph. D. from the University of Chicago in 1900, and that of LL. D. from Lehigh University in 1909 and Allegheny College in 1915. His principal teaching work was in history, the period 1884–85 being spent at Ohio State University, that from 1890–1895 at the Pennsylvania College, and that from 1905–1908 at the University of Chicago. He was also the author of numerous treatises on various phases of American history.

His service as president was notably successful, the college increasing greatly in numbers, resources, and influence during his administration.

Doctor Sparks was greatly interested in the promotion of scholarship in American higher education, and upon retirement as president rendered a timely and constructive service in this field by accepting the presidency of the honorary scholarship fraternity, Phi Kappi Phi. For several years he devoted himself with rare zeal and assiduity to the up-building of this fraternity, particularly in the land-grant institutions, as a concrete means of elevating academic standards and maintaining high scholastic ideals.

EXPERIMENT STATION RECORD.

VOL. 51. SEPTEMBER, 1924 No. 4.

For some time there has been increasing interest in this country in the present and prospective status of electricity on the farm. Somewhat over a year ago there was organized a National Committee on the Relation of Electricity to Agriculture, on which are represented the American Farm Bureau Federation, the National Electric Light Association, the American Society of Agricultural Engineers, and the United States Departments of Commerce, Interior, and Agriculture. In cooperation with this committee, and at its request, the Office of Experiment Stations has undertaken a study of the research features of the subject with a view to assisting the experiment stations and other agencies in the planning and conduct of experimental work in this field. A report summarizing some of its findings was recently presented to the American Society of Agricultural Engineers. Cooperative studies on quite an elaborate scale have also been recently undertaken by several stations, among them those in Alabama, Minnesota, Missouri, Virginia, and Wisconsin.

The question of the use of electricity on the farm is one of importance in view of the numerous advantages of this source of energy, notably its convenience and its potentialities in rendering rural life more pleasant and attractive. These advantages are becoming widely realized by farmers and their families, and there is a growing demand from farming centers for the extension to their premises of electrical service at a cost which they can afford. The outstanding obstacle in many regions, even those most favorably located as regards power production, has been the high rates as compared with those commonly available to urban consumers.

Unfortunately, as regards rural needs, the cost of production of electrical energy is in the majority of cases a relatively small item as compared with the expense of transmission, distribution, and transformation. The customary farm electrical load of the present is that represented mainly by lighting and certain relatively small belt and shaft jobs in the house and nearby buildings. When the long distance transmission required by rural electrical lines and the relatively small number of consumers per mile of transmission are considered, it would seem that American farmers as a class will experience considerable difficulty in securing central station electrical service at urban rates as long as the consumption of electrical energy by the individual farmer represents a load not much greater comparatively than that of the urban consumer.

On the other hand, it is obvious that most farmers can not utilize electrical energy in their farm operations unless its cost and the returns therefrom are such as to make the practice a profitable one. The central stations, however, can not be expected to invest money in equipment for meeting a rural electrical load unless that load is large enough and constant enough to yield a reasonable return on the investment. Since the present farm load does not usually incorporate the factors of size and constancy which make for mutual profit, it appears that to establish such service generally the agricultural uses of electricity must be increased to such an extent that the resulting load will permit a rate which will be advantageous for both the central stations and the individual farmers.

The practical problem thus becomes one of a wider utilization of electrical energy, and in its solution studies covering nearly the entire range of agricultural research will doubtless be necessary. It involves not only the application of electricity as a source of energy to present farming practices but also the development of new practices made possible by its use, such as the more complete processing of products, the utilization of latent natural resources on the farm, and the staggering of industrial operations with farm operations to secure constancy as well as size of profitable load.

Preliminary investigation has suggested in a broad way the employment of electricity in a considerable number of general agricultural practices already in vogue. In all of these fields the opportunity for investigation exists in greater or lesser degree. In the case of some of them, such as lighting, heating, and cooking, much of the data collected under urban conditions has considerable direct application, although even in these lines the differences in conditions present numerous points of inquiry. The remaining phases are so distinctively rural as to necessitate specific individual study, and in most cases this has not as yet been provided.

Electric lighting, the most obvious use, is so well established a practice in both farm and city dwellings as to offer no special scientific problem other than that of possible improvement in illuminating detail. Experience in Europe and Canada, as well as in this country, indicates that the main problem presented on the farm is one of economics. The farm lighting load is fairly constant the year round, except as influenced by the seasons, but in itself it is seldom large enough to justify general rural electrification where the population is scattered.

Heating of houses by electricity is not by any means a well established practice even in cities, owing to the attendant expense. However, it offers a means of increasing the electrical load, and the available information indicates that it is convenient, effective, clean, and relatively safe. The fact that it is expensive as compared with other methods may suggest a lack of perfection of detail of the heating apparatus itself, as well as inadequate knowledge as to its proper manipulation and use.

Although past experience has shown that cooking with electricity is in general not a very economical procedure, its development in some localities seems worthy of investigation. Studies in Europe, Australia, at the Kansas State Agricultural College, the University of Missouri, and elsewhere have indicated that the problem in electrical cooking is twofold. The first is one for the attention of the food and cooking specialist, in order that the exact requirements for the optimum cooking of different foods may be determined. This when accomplished would serve as a basis for the perfection of cooking apparatus by the engineer and its proper and economic manipulation.

Several phases of food preparation also are closely allied to cooking as far as the building up of a rural electrical load is concerned. Such practices include the canning of fruits and vegetables, for example, and the making of preserves and jellies. As in the cooking of foods, it is necessary to determine the exact requirements for heat and energy in the preparation of these foods as a basis for the economical development and operation of the electrical apparatus required. The dehydration of fruits apparently offers another opportunity for extending the use of electricity, especially in view of the susceptibility of electrical energy to precise manipulation and control. Work at the California Station in particular has brought out some of the primary requirements of dehydration, indicating the importance of exact measurement and control of such factors as temperature, moisture, and ventilation.

Perhaps the largest opportunity for contributing to electrical development is to be found in the use of electricity as the source of energy in the large number of belt, shaft, and traction jobs around the farmhouse and yard and in the field. As brought out by the Wisconsin and other stations, the power requirements of many of the smaller of these jobs are so well known and so nearly identical as to offer practically no problem from the standpoint of research. On the other hand, studies in this country and in Europe have shown that, when the larger belt, shaft, and traction operations are taken into consideration, the requirements are no longer met by merely belting or shafting a standard motor to existing power machinery. Recent work at the Wisconsin station on silage cutters especially, in which power requirements, capacities, and optimum operating speeds varied widely, serves as a striking illustration of the problems confronting those who would use electrical energy generally for this class of work.

The use of electrical energy in mechanical farm operations in the field, such as plowing and cultivating, has often been suggested. The load on such work would continue practically throughout the growing season and might possibly be extended further if electric tractors and trucks were developed suitable for farm hauling. Studies abroad and in this country, at the California, Iowa, and Alabama stations, for instance, have been conducted, but they have indicated that the development of an effective and economical tractor or plowing outfit has not proceeded much beyond the preliminary stages. The variable results so far obtained would suggest that not enough is yet known about plowing and cultivating and the machinery suitable therefor to form a sound basis for the final development of electrical traction plowing apparatus. It is not improbable that such development may follow the elucidation and establishment of the fundamental principles of soil dynamics and the development of the corresponding tillage machinery if success is to be achieved in this field.

Because of the heavy power losses in large units it would seem that success in the use of electricity generally in mechanical farm operations will lie largely in the development of the use of smaller power units. This is borne out to a certain extent by experimental data already available, and strongly indicates the ultimate necessity of overhauling practically all of the larger power operations with a view to effecting the application of smaller power units operating over longer periods of time. It seems evident, therefore, that the building up of a profitable electrical load in connection with mechanical farm operations must be the result of much thorough study leading to the eventual development of processes and machines.

The use of electricity in the stimulation of crop production, entirely aside from the mechanical operations involved, has attracted the attention of scientists in this and other countries for several decades. In work at the Massachusetts, New York Cornell, West Virginia, Minnesota, and other stations, and at Rothamsted and elsewhere in Europe, the attempt has been made to get at the fundamentals from the standpoint of crop production and to make a profitable application of them. Apparently the proper application of electricity to crops does directly or indirectly stimulate growth and yield to a certain extent under some conditions. In the recent presidential address before the Section of Agriculture of the British Association at Toronto, Sir John Russell announced that increases in plant growth amounting to from 20 to 25 per cent have been obtained in England by the influence of high tension electrical discharge, which presumably acts by increasing in some way the efficiency of the plant as an energy transformer. The value of experiments along this line, in his opinion, lies in the great increase in yield obtainable by a small increase in efficiency. If the fundamental nature of the process and the requirements for maximum stimulation of crop growth and yield could be determined and the corresponding proper methods of applying the electricity established. it is possible that a relatively large amount of electrical energy might be advantageously employed in this way.

It must be admitted, however, that the work on electroculture is so far quite incomplete and the results obtained more or less unsatisfactory and in many cases contradictory. On the other hand, in its development numerous definite lines of fundamental study have been indicated. These lines may be grouped broadly under stimulation by electric light, by overhead atmospheric electrical discharges, by soil electrification, and by direct or indirect electrical treatment of seed.

Studies on the influence of electrical illumination of crops have shown in general that the advantage gained lies mainly in hastened maturity. Incandescent lights seem to be somewhat superior to arc lights, and apparently the color spectrum has a bearing on the matter. It would seem that the problem now is to determine those plants which are actually benefited by such treatment, the nature of the benefit, their specific requirements for light to produce optimum growth and yield, and the degree and color of illumination giving the most profitable results, as a basis for developing this practice.

The results of experience in the overhead electrical treatment of crops have been varied. While obviously the main object of most of this work has been to determine the nature of the influence of overhead electrical stimulation on plant growth phenomena, it would seem that too little attention has been given to the actual requirements of optimum growth and yield and the corresponding amounts, rates, frequencies, manner of application, and other characteristics of overhead stimulation which may promote such growth conditions.

The stimulation of crop growth and yield by means of electrical currents passed through the soil has not been investigated so extensively as has the atmospheric discharge method, and its economic value is also yet to be established. The apparently contradictory nature of some of the results so far obtained suggests the importance of more study from the standpoint of the requirements of optimum plant growth in different soils. Apparently the nature of the soil has an influence on the effect of electrification of crops; and the nature of the electrical current, whether direct or alternating, seems to merit investigation, with special reference to the reaction of different plants to such stimulation.

Work on the electrical treatment of seed has apparently been divided into electrochemical treatment and attempts to effect direct germination by electrical currents. The former process consists essentially of passing a current of electricity through a solution of common salt or some other compound in which the seed is immersed. Experiments at the Canada Experimental Farms, the Rothamsted Experimental Station, and the Arlington Experimental Farm of this department have not given evidence of much promise for this process. Results with the direct stimulation method have seemed slightly more encouraging. Experiments have indicated the possibility of developing the use of alternating currents of low intensity for the purpose, although evidently much more must be learned regarding the requirements of proper germination of seed.

While apparently little investigation has been undertaken on the use of electricity in processes specifically related to livestock production, it would seem that this field may offer some opportunities. Interest in the science of ventilation of animal shelters is developing, and should eventually open up a field for the use of electricity in forced ventilation. The preservation of succulent feeds and the curing or drying of such feeds as hay and grain by electricity suggest other potential uses of electricity in matters relating directly to animal production. Experiments at the California station and in Scotland, Switzerland, and Germany have indicated the possibility of developing such processes on a profitable basis.

The artificial lighting of feed lots by electricity has also been suggested as a possibility, but considerable study would be necessary to determine more definitely what are the light requirements of animals corresponding to optimum feeding conditions. A limited amount of study in this country and in England has indicated that electricity may be used as a direct stimulus to the growth and development of poultry, although it has apparently not been established whether prolonged electrical action increases growth up to maturity or whether its whole effect is to cause the maximum size to be reached sooner. Much must yet be learned regarding the nature of the stimulation as a basis for determining the requirements of optimum growth and the best methods of promoting the corresponding conditions by electrical stimulation.

The use of electric light for increasing egg production, especially during the winter months, has given promising results at several of the stations and is being attempted commercially to a considerable extent. While there is more or less disagreement as to proper practice, the results of experience indicate that artificial illumination results in greater egg production when eggs are scarce and expensive, even though it does not necessarily increase the total annual egg production and there is some evidence to show that the total production is frequently decreased. Apparently there is a problem involved which will require the determination of the best kind, periods, and intensity of illumination for different breeds of poultry under different specific conditions.

Another use of electricity in poultry husbandry which seems worthy of further development is for heating brooders and incubators. Experiments at the California station have demonstrated not only the effectiveness but the economy of the electric current for brooder heating as compared with coal oil, coal, and gas heated hot water. Preliminary studies have also been undertaken at the Alabama station on the electrical control of the fundamental factors entering into the incubation of hens' eggs. These have already indicated that temperature, humidity, ventilation, carbon dioxide, length of cooling, and time of turning are among the factors which must be studied and controlled between certain optimum points.

The processes involved in dairying which require heat and power offer opportunity for the development of an appreciable addition to the rural electrical load. Electrically operated machine milkers are being used quite extensively in this country and in Europe, and to some extent appliances for pasteurization, sterilization, etc. A probable special advantage of electricity in milk sterilization has been indicated by the fact that pathogenic organisms and bacteria can be killed in milk by high tension alternating currents without reducing the value of the milk as a food, especially for babies. There is still reason to believe, however, that more should be known as to the exact result it is desired to accomplish in such processes, and their electrical requirements.

The greatest employment of electricity in orchard practices will probably occur in those operations requiring power such as spraying, cultivation, etc. Another use, however, the possibilities of which may warrant specific development, is for orchard heating to prevent injury to fruits by late frosts. Such a procedure usually meets a very sudden and pressing emergency which may mean success or failure of the crop for the year. Experiments at the Utah and several other experiment stations have indicated the possibility of making a profitable use of electricity for this purpose where fruit is grown on a large scale. The problems involved are numerous, however, and it would seem that more study is still needed to establish the ranges of minimum permissible temperatures for various fruits at different stages of early development in different localities to serve as a basis for the development of the most effective and economical methods and apparatus for supplying the necessary amounts of heat by electricity. This will naturally involve a consideration of such factors as wind velocity, topography, and general climatic conditions.

Numerous other agricultural practices in which the use of electricity might be extended may be mentioned, such as drainage and irrigation pumping, combating insect pests, and wood seasoning. All of these have at least a brief history of experimental work to indicate their possibilities as profitable contributors to a rural electrical load. In most cases, however, their specific requirements must be better understood before the use of electricity can be placed upon a strictly economic basis.

The conclusion seems inevitable that not enough of a fundamental nature is now known regarding the exact requirements of the more important processes of specific types of farming to justify the immediate and arbitrary electrification of large rural areas. While a considerable amount of both fundamental research and more elementary investigation has been undertaken, much lack of knowledge and even disagreement on important specific points is evident, indicating the necessity for more systematic experimentation in many cases to establish the facts involved. In other cases the work has never advanced much beyond the suggestive stage, although the progress findings have been quite promising. In still other instances, such as tillage, the basic principles of the practice itself have never been established, thus indicating the necessity first for research on the process and then for the development of the machinery required to perform the process before electricity can be applied effectively and economically as the source of required power. Apparently only in a comparatively few cases are the agricultural facts so well established that the work remaining amounts merely to an exercise of applied agricultural engineering.

Thus it seems evident that the rational application of electricity to agriculture will require, first, a large amount of fundamental agricultural research to provide a foundation for the movement, and, second, a certain but gradually increasing amount of engineering and experimentation to determine power requirements and exact electrical applications.

The oportunity open to the stations for constructive contributions to the problem seems apparent. There is the special incentive that a disposition already exists on the part of both prospective producers and consumers of electrical energy on the farm to utilize as rapidly and completely as possible whatever findings may be made available.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A new method for the separate extraction of vacuole and protoplasmic material from leaf cells, A. C. CHIBNALL (*Jour. Biol. Chem., 55 (1923), No. 3, pp. 333–342*).—The method described consists essentially in plasmolyzing the cells by means of certain organic agents such as ether, butyl alcohol, choloroform, etc., and pressing out the larger part of the vacuole content in the Buchner press. This process is said not to rupture the leaf cells, thus retaining the protoplasm from which some of the water-soluble constituents have been washed out. This protoplasmic material can be extracted by grinding with water and obtained from its colloidal solution by flocculation with acid.

The extraction of nitrogenous constituents from plant cells, W. E. TOTTINGHAM, E. R. SCHULZ, and S. LEPKOVSKY (*Jour. Amer. Chem. Soc., 46 (1924), No. 1, pp. 203–208*).—A study is reported from the Wisconsin Experiment Station and the Office of Cereal Investigations, U. S. D. A., of the best methods of preserving plant tissue for subsequent determination of nitrogenous constituents and of the relative efficiency of various methods of extracting the soluble constituents. The tests of the various methods were based upon determinations of total nitrogenous compounds soluble in water and soluble nitrogenous compounds coagulable by boiling.

The effects of freezing by ice and salt mixture and of drying at 40° C. without aeration were tested with leaves of the sugar mangold. The total soluble nitrogen and soluble protein in dry matter of the freshly extracted tissue were 4 and 3.4 per cent, respectively, while corresponding figures for the tissue dried at 40° were 2.2 and 0.5, and frozen by ice-salt mixture 3.3 and 2.3 per cent, respectively.

The effect of desiccation at higher temperatures with rapid aeration was tested with leaves of the sugar beet and barberry in the apparatus described by Link and Tottingham (E. S. R., 49, p. 9). At the three temperature ranges 55–60, 65–66, and 70–72°, with rapid aeration, the lower ones produced the least alteration in the constituents determined. The variations in both soluble and coagulable nitrogen in sugar beet leaves dried with rapid aeration at about 65° were nearly equal as compared with extracts from the fresh material, indicating that the chief disturbance in this case was precipitation of the protein. "The only alternative from direct extraction of fresh material, therefore, seems to be desiccation of amenable tissues at temperatures which allow only coagulation of the soluble protein and recovery of the latter with that originally insoluble."

The methods of extraction tested included extraction by pressure of varying degrees and direct water extraction of the crushed leaves. The latter proved the more satisfactory. A comparison of this method with that of Chibnall, noted above, showed that the latter does not separate nonprotein nitrogen from protein nitrogen.

A comparison was also made of the method of water extraction with the use of an alcoholic solution of 0.2 per cent sodium hydroxid and with brief hydrolysis by 20 per cent hydrochloric acid as recommended by Hamilton et al. (E. S. R., 46, p. 405). The results obtained by the various methods with the leaf tissue of the sugar beet were as follows: Water-soluble 1.32, alkali-soluble 0.18, acid-soluble 0.25, and total-soluble 1.75 per cent.

"These data show that only a small portion of the exposed protein of the cell fails to dissolve in water, as indicated by the slight solvent effect of alcoholic alkali. Even the rather drastic acid treatment leaves about 40 per cent of the cell nitrogen in the tissue. It appears probable that this residual ported on the extraction of pectinogen from sugar cane fiber by ammonium and relatively inert in metabolic processes."

The pectic substance of sugar cane fiber, R. G. W. Farnell (*Internatl. Sugar Jour., 25 (1923), No. 300, pp. 630–636*).—Laboratory experiments are reported on the extraction of pectinogen from sugar cane fiber by ammonium oxalate or oxalic acid and its determination as calcium pectate by the method of Carré and Haynes (E. S. R., 47, p. 610), on the extraction of cane fiber by various solvents and the determination of pectin and pectosan in the resulting extracts, and on the precipitation of pectin from extracts of cane fiber by calcium hydroxid of various concentrations. From the results obtained the following suggestions for factory practice are made:

> Very little of the pectinogen contained in the bagacillo will be extracted at temperatures up to 120° C. At this temperature a smaller amount of pectinogen will be extracted by acetic acid of the same H-ion concentration, pH 5, as raw juice than by water, pH 7. The precipitation of pectin as calcium pectate will occur only in those processes in which the solution is alkaline to phenolphthalein. In the carbonation and sulphitation processes where milk of lime is added, the precipitation should be complete. The removal of the bagacillo as quickly as possible by means of strainers or centrifugals is considered most important, not only on account of the presence of pectinogen but also because it is conducive to the growth of bacteria.

Protopectin and some other constituents of lemon peel, R. Sucharipa (*Jour. Amer. Chem. Soc., 46 (1924), No. 1, pp. 145–156, figs. 2*).—Pure protopectin was prepared from the white part of lemon peel by extraction of the peel successively with alcohol and ether, cold distilled water, and Schweitzer's reagent. The fine white powder left after complete removal of the solvents was hydrolyzed with a hot 0.5 per cent solution of ammonium oxalate and the pectin precipitated from the resulting solution with alcohol. The residue from the hydrolysis dissolved almost completely in Schweitzer's reagent, showing it to be cellulose.

A comparison of the methoxyl content of free pectin and of the pectin hydrolyzed out of the protopectin showed that the former contains much more methoxyl. By progressive hydrolysis products were obtained containing less and less methoxyl. This is thought to indicate that protopectin is not a homogeneous substance, but is made up of a series of pectins in which the methoxyl groups are more or less completely replaced by the cellulose radical.

A series of pectins was prepared from fresh and dried peel, and determinations were made of the free pectin and of the pectin formed after pressure hydrolysis with water, hydrolysis with 50 per cent sucrose solution, and hydrolysis with 0.5 per cent ammonium oxalate solution. The percentages of pectin, methoxyl, and soluble cellulose obtained after each extraction and calculated as percentages of the original dry peel or albedo were respectively as follows: Pectin 7.63, 3.31, 0.99, and 9.71 per cent; methoxyl 11.33, 10.2, 8.08 and 2.05 per cent; and cellulose 15, 16.3, 16.74, and 23.94 per cent.

In discussing these data, the author presents the following hypothesis as to the nature of protopectin and its transformation into pectin in the cell wall: "Protopectin may be represented as a compound of pectin and cellulose in which the methoxyl groups are replaced in part by cellulose groups. From the experimental results it can be stated that there is quite a range of protopectins in which the content of cellulose decreases with the increase of pectin and its methoxyl groups. There is most probably a continuous transition between the pure cellulose cell wall and the pure pectin film, the first representing the innermost part of the wall and the second the outer layer. From the cellulose part there is a gradual transition into protopectin rich in cellulose, then the pectin content gradually increases as the outer layer of the cell wall is approached, finally becoming pure or "free" pectin. Between the two extremes there must be quite a number of compounds, but no homogeneous mixture or system of layers results."

Chemistry of wood.—VII, Relation between methozyl anl lignin in wood, G. J. Ritter (*Indus. and Engin. Chem., 15 (1923), No. 12, pp. 1264–1266*).—In continuation of the investigation previously noted (E. S. R., 50, p. 712), a further difference in the chemical composition of hardwoods and softwoods is noted, i. e., a difference in the linkage of the methoxyl group in the two classes. This is shown by the observation that the theoretical and isolated lignins of softwoods are more nearly identical in composition than the corresponding lignins of hardwoods, and that the methoxyl not recovered in the isolated lignin is considerably less in the softwood than in the hardwood.

Approximately 62 per cent of the total methoxyl in white oak and yellow pine sawdust was recovered as methyl alcohol by treating the wood with dilute alkali under pressure. This is equivalent to the methoxyl found in the crude volatile products of the destructive distillation of wood.

The properties of activated carbon which determine its industrial applications, N. K. Chaney, A. B. Ray, and A. St. John (*Indus. and Engin. Chem., 15 (1923), No. 12, pp. 1244–1255, figs. 9*).—The authors discuss the theoretical and technical phases of carbon activation under the following headings: Principles of activation, fundamental criteria of activation and adsorptive capacity, general processes of carbon activation, adsorption of gases and vapors by carbon and silica gel, and adsorption from liquors and solutions.

The last two sections contain lists of various commercial applications of gas adsorbent and liquid adsorbent types of carbons. Under the latter are included the making of white sugar directly from cane juice; the purification of organic and inorganic acids and of a great variety of organic liquids; the decolorization of waxes, gelatin, glue, etc.; the removal of objectionable colors and flavors from edible oils and fats; and the recovery of alkaloids from solution.

The preparation of a crystalline picrate having the antineuritic properties of vitamin B, A. Seidell (*Pub. Health Rpts. [U. S.], 39 (1924), No. 7, pp. 294–299*).—Continuing the attempts to isolate the antineuritic vitamin from brewery yeast, the author has succeeded in precipitating the fraction obtained by adsorption on fuller's earth as a relatively insoluble picrate and separating this into at least two definitely crystalline compounds, one of which has a high degree of antineuritic activity.

The extract, prepared as described in a previous paper (E. S. R., 48, p. 611), is first freed from potassium by the following method: The extract is dissolved in water and diluted to a definite volume. An aliquot of this is evaporated to dryness, the residue ignited, and the resulting ash titrated with N/10 H_2SO_4, using methyl orange as indicator. From the amount of acid required the amount of N acid equivalent to the bases present in the entire solution is added to the main solution and the mixture distilled under reduced pressure almost to dryness. The residue is treated with 66 per cent ethyl alcohol and the insoluble potassium sulphate removed by filtration. The protective dose of the alcoholic filtrate thus obtained was found to be 4 mg. given on alternate days to pigeons fed polished rice.

The picrate is prepared by adding to this alcoholic extract an amount of picric acid, dissolved in methyl alcohol, approximately equal in weight to the solids present in the extract. The alcohol is then gradually removed by evaporation under diminished pressure, water being added at intervals to replace it. The precipitate is finally separated by centrifugation and washed with small portions of water. The crude picrate is purified by adding to 5 gm. of the material 8 cc. of 95 per cent acetone, stirring for 3 minutes, centrifuging, and decanting the clear reddish yellow acetone solution. The process is repeated successively with 4, 2, and finally 1 cc. of the acetone. To the combined acetone extracts is added 10 cc. of water and the mixture allowed to evaporate in a partially evacuated desiccator containing sulphuric acid. When the volume has been reduced about one-third, 2 cc. of water is added, and the process is continued until the further addition of water produces no precipitate. The solid is then filtered on a small perforated porcelain disc and paper filter and washed with a little water. The process is generally repeated.

The twice crystallized picrate consists of irregularly shaped, transparent, crystalline flakes which protect fully grown young pigeons in doses as low as 2 mg. daily. The portion of the crude picrate insoluble in 95 per cent acetone dissolves in dilute acetone, yielding on recrystallization pale yellow rods or prismatic crystals which have very little activity. Combustion analyses of the two picrates gave results which agree closely and correspond to the formula $C_6H_{18}O_2N_3.OH.C_6H_2(NO_2)_3$.

Attention is called to early attempts made by Suzuki et al. (E. S. R., 28, p. 168) to isolate the antineuritic vitamin from rice polishings in which a crystalline picrate having antineuritic properties was prepared. From the description of this picrate it is thought that the form obtained was the inactive form of the present investigation, but containing a small amount of the active form as an impurity.

The separation of the antineuritic vitamin from yeast as a picrate [trans. title], G. Bertrand and A. Seidell (*Bul. Soc. Chim. Biol., 5 (1923), No. 9, pp. 794–796*).—Essentially noted above.

Studies on the chemistry of cod liver oil. I, The effect of hydrogenation upon the vitamin content, H. E. Dubin and C. Funk (*Soc. Expt. Biol. and Med. Proc., 21 (1923), No. 3, pp. 139–141*).—Cod liver oil subjected to a mild hydrogenation process conducted at 55° C. for about 36 hours was found to possess antirachitic properties when used in amounts corresponding to 0.1 gm. of the original cod liver oil in both curative and preventive tests. The hydrogenated oil is said to be a snow-white, odorless, and tasteless product melting at about 55°, the yield being about 95 gm. from 100 gm. of the original oil.

On extracting the hydrogenated product with alcohol the residue proved inactive when fed in amounts corresponding to 0.25 gm. of the original oil daily. The alcohol extract on evaporation gave a creamy-white substance melting at about 30°. About 4.5 gm. of this was obtained from 95 gm. of the hydrogenated oil. This proved active in antirachitic properties when fed in amounts equivalent to 0.1 gm. of the original oil. On removing the cholesterol from this fraction about 0.045 gm. of a product of similar appearance was obtained, which was active in amounts equivalent to 0.25 gm. of the original oil. Smaller amounts were not tested.

A comparative analytical study of various oils in the chaulmoogra group, G. A. Perkins (*Philippine Jour. Sci., 23 (1923), No. 6, pp. 543–571, pl. 1*).—This paper includes a summary from the literature of physical and chemical data on chaulmoogra and related oils, and the results obtained in the examination of authenticated seeds of 10 species related to chaulmoogra and in the analysis of oils obtained from these seeds by extraction and of 15 samples of commercial chaulmoogra and related oils.

The composition of whale oil, C. H. Milligan, C. A. Knuth, and A. S. Richardson (*Jour. Amer. Chem. Soc., 46 (1924), No. 1, pp. 157–166*).—The composition of whale oil was studied by a combination of two methods, the fractional distillation of the methyl esters of the fatty acids and the separation of solid and liquid fatty acids by the fractional precipitation of the lead salts of the solid acids from alcoholic solutions.

The oil was found to resemble other marine animal oils in containing a complicated mixture of fatty acids of carbon content varying from 14 to 22. The approximate composition of these fatty acids is given as follows: C_{14}, myristic acid 4.5 per cent; C_{16}, palmitic 11.5, palmitoleic 17.0; C_{18}, stearic 2.5, unsaturated (nearly all oleic) 36.5; C_{20}, unsaturated 16; C_{22}, unsaturated 10; and C_{24}, unsaturated 1.5 per cent, with unsaponifiable matter 0.7 per cent.

The purification of oils, W. W. Myddleton (*Chem. Age [London], 10 (1924), No. 245, pp. 186, 187*).—In this review of the more recent work on oil purification, the term purification is defined as "the removal or modification of substances which prevent the oil from functioning efficiently when used for a specific purpose." The topics considered from this standpoint are the purification of oils to be used for edible purposes, of oils used in the manufacture of paint and varnish and of soap and candles, of lubricating oils, and of oils used for hydrogenation. A brief discussion is included of the future of extracted oils and of the bleaching of oils by ozone.

Analysis of the Jerusalem artichoke, A. T. Shohl (*Jour. Amer. Chem. Soc., 45 (1923), No. 11, pp. 2754–2756*).—An analysis of the edible portion of the Jerusalem artichoke, *Helianthus tuberosus*, is reported as follows: Moisture 79, protein (N×6.25) 3.1, fat 0.2, carbohydrate 15.5, crude fiber 0.8, and ash 1.1 per cent. The carbohydrate was found to consist entirely of inulin. The amino acid nitrogen determined by the Van Slyke method was 27.5 per cent of the water-soluble nitrogen. It is reported that tests conducted by M. Koch on the antineuritic properties of the juice of the artichoke have shown it to contain vitamin B in small amounts. The juice had a pH value of 5.

A modification of Duboscq-Pellin colorimeter for bicolorimetric work as in colorimetric pH determination without buffer mixtures, H. Wu (*Soc. Expt. Biol. and Med. Proc., 21 (1923), No. 2, pp. 111–114, fig. 1*).—The modification described consists essentially in placing on one side of the colorimeter a new cup carried on a new stage with an independent rack, pinion, and vernier. The upper of the two cups on this side has the same capacity as an ordinary Duboscq cup, and with it the original cylinder is used. The lower cup is similar to the ordinary Duboscq cup, but is a little shorter and larger in diameter. The cylinder for this is made from pyrex tubing 48 mm. in diameter and 2 mm. thick. The only change in the other side is the replacement of the original disc by two discs of the same thickness and the same glass as the disc for the upper and lower cups of the other side. The method of altering the original colorimeter is described, with accompanying diagram, and the use of the instrument is illustrated by a test with phenol red in alkali and acid, using the buffer solutions recommended by Hatfield (E. S. R., 49, p. 202).

A water-jacketed hydrogen electrode, H. S. Simms (*Jour. Amer. Chem. Soc., 45 (1923), No. 11, pp. 2503–2507, figs. 2*).—"A simple water-jacketed hydrogen electrode cell of the bubbling type is described, which is accurately maintained at constant temperature with water from a bath, circulated by means of an air lift. It gives accurate readings reproducible to 0.01 pH with 1 or 2 cc. of solution after three minutes' saturation with hydrogen, even with solutions of low conductivity.

"It has a single stopcock which performs separately the following functions: It permits (1) bubbling of hydrogen gas through the solution, (2) drainage of solution, (3) drainage of potassium chlorid solution from the salt bridge, and (4) formation of liquid junction."

A method for the determination of the inorganic components of the colloidal complexes in soils.—Preliminary contribution [trans. title], O. Tamm (*Meddel. Statens Skogsförsöksanst.* [*Sweden*], *No. 19,* (*1922*), *pp. 385–404*).—The author recommends as a solvent for the inorganic constituents of soils a solution of acid ammonium oxalate prepared by dissolving 31.52 gm. of oxalic acid and 62.1 gm. of neutral ammonium oxalate in 2.5 liters of water. This solution contains per liter 0.2 mol of acid ammonium oxalate and 0.075 mol of neutral ammonium oxalate, and has an H-ion concentration between pH 3.20 and 3.27.

Analyses of various soils extracted with this solvent under varying conditions of time, shaking, etc., are reported. An extension of the time of shaking beyond 60 minutes did not increase the amount going into solution. Analyses of the same sample of soils in different states of fineness gave no difference in results beyond the limits of experimental error, provided the material was well mixed. For accurate results with most soils, two and possibly three successive extractions are recommended.

The determination of potash in soils, A. H. Dodd (*Jour. Agr. Sci.* [*England*], *14* (*1924*), *No. 1, pp. 139–150*).—In the course of a series of soil analyses by the perchlorate method difficulties were encountered, particularly in the nature of the precipitate obtained on the addition of alcohol to the perchloric acid concentrate. The cause of the trouble appeared to be the presence of sulphates in the precipitate, amounting in some cases to over 5 per cent calculated as $CaSO_4$. Various attempts to modify the process were made but without much success. Good results were obtained, however, in the analyses of these soils by the cobaltinitrite method. This is recommended as a substitute for the perchlorate method, having the advantages of being cheap, simple to carry out, and unaffected by small quantities of other substances.

The determination of noncoagulable nitrogen (residual nitrogen) [trans. title], F. Fonseca (*Biochem. Ztschr.*, *144* (*1924*), *No. 1–2, pp. 175–178*).—A comparison is reported of four different methods for the removal of protein from samples of blood to be used for determinations of residual nitrogen, involving respectively the use of colloidal iron, sodium tungstate, trichloracetic acid, and trichloracetic acid followed by sodium tungstate.

The results obtained by the different methods agreed quite closely. In general the lowest figures were obtained following the use of iron and increasing amounts with the Folin-Wu phosphotungstic acid method, the trichloracetic acid method, and the trichloracetic acid-sodium tungstate method in the order mentioned.

A comparison of the figures obtained on the serum of the same subject while fasting and following the ingestion of food rich in carbohydrate, protein, and fat, respectively, showed that carbohydrates and fats had no appreciable influence. Following the ingestion of protein notably higher results were obtained by all the methods except the one involving the use of colloidal iron.

The titration of amino and carboxyl groups in amino acids, polypeptids, etc.—IV–VI, Estimations in presence of formol and alcohol, L. J. Harris

(*Roy. Soc. [London] Proc., Ser. B, 95 (1924), No. B 671, pp. 500–522*).—This continuation of the investigation previously noted (E. S. R., 50, p. 802) consists of three parts as follows:

IV. *The Sörensen and Foreman methods for estimating carboxyl.*—This is a theoretical discussion of the Sörensen and the Foreman (E. S. R., 44, p. 411) methods of estimating carboxyl by titration after the addition of formaldehyde or alcohol.

V. *Modification of the Foreman technique.*—The author has found that amino acids which give low titration results by the Foreman method titrate quantitatively with the addition of small amounts of formaldehyde and, similarly, acids which give low results by the Sörensen formol method titrate quantitatively with the addition of small amounts of alcohol. A modification of the Foreman method which takes this into consideration is suggested. This consists in adding alcohol (80 per cent of the total volume) and neutralized formol (5 per cent of the total volume) to the amino acid solution, which is then titrated with aqueous N/10 or N NaOH, with phenolphthalein as indicator. A method which has been found preferable consists in the titration of the acid with N/10 sodium hydroxid in the presence of 80 per cent alcohol to a blue color with thymolphthalein. This does away with the necessity of adding formol and of using alcoholic potassium hydroxid.

VI. *Estimation of $-N.H_2$ in alcoholic and formaldehyde solution.*—It has been found that the modified method using thymolphthalein can be extended to the determination of NH_2 groups by adding methyl red to the solution neutralized to thymolphthalein and titrating with standard HCl to an orange color. Under these conditions " the amount of acid so required is approximately equivalent to the total amino groups present. This result depends on the neutrality to methyl red, even in presence of alcohol, of the following bodies: Monoaminomonocarboxylic acids, monosodium salt of glutamic and aspartic acids, monohydrochlorids of arginin and lysin. The method is of use in distinguishing between the three types of amino acids. Blank corrections should be applied to the two titrations."

Experimental data are reported illustrating the use of these methods.

The estimation of pentoses and pentosans.—II, The determination of furfural, N. C. Pervier and R. A. Gortner (*Indus. and Engin. Chem., 15 (1923), No. 12, pp. 1255–1262, figs. 4*).—In this continuation of the investigation previously noted (E. S. R., 51, p. 12) the literature on methods of estimating the furfural obtained from the acid distillation of pentoses is reviewed briefly, the present Official method is criticized, and a detailed report is given of the development of a new method involving the use of potassium bromate. This was suggested by the method of Okuda for the determination of cystin (E. S. R., 43, p. 505). The technique finally adopted is essentially as follows:

To the solution containing from 0.1 to 0.2 gm. of furfural 5 cc. of 20 per cent potassium bromid is added for every 100 cc. of solution, and the acidity (HCl) is adjusted to about 4 per cent by weight. An N/10 solution of potassium bromate is added from a burette with constant stirring at such a rate that the production of a distinct yellow color is avoided. When a pale yellow color appears immediately after the addition of a few drops of the bromate solution the solution is added in 0.2 to 0.3 cc. amounts, and the time is recorded which is required for the disappearance of free bromin as indicated by the use of a galvanometer. The end point is indicated by the large increase in time required.

An extensive bibliography is appended.

Some factors that determine the quality of sauerkraut, E. B. Fred and W. H. Peterson (*Canner, 58 (1924), No. 11, II, pp. 120–125, figs. 3*).—This is a general report of the studies on sauerkraut which have been conducted at the

University of Wisconsin and some of which have been noted previously from other sources (E. S. R., 46, p. 502; 47, p. 113). From the results of analyses by 10 different chemists, the average composition of cabbage and of sauerkraut is given as follows: Moisture 91.7 (cabbage) and 91.3 per cent (sauerkraut), ash 0.9 and 0.72, crude protein 1.54 and 1.21, crude fiber 1.06 and 1.25, ether extract 0.18 and 0.65, and nitrogen-free extract 4.62 and 4.87 per cent, respectively. The amounts of glucose and sucrose are given as 3.1 and 0.86 per cent for cabbage and 0.49 and 0 per cent for sauerkraut.

Differences in the chief fermentation products in 9 analyses of normal commercial sauerkraut and 13 of normal commercial canned sauerkraut are shown by the following average figures: Moisture 91.3 and 92.9 per cent, N/20 acid in 5 cc. of brine 16.9 and 11.6 cc., volatile acid as acetic 0.31 and 0.22 per cent, nonvolatile acid as lactic 1.21 and 0.89, ethyl alcohol 0.47 and 0.20, and sugar as glucose 0.21 and 0.6 per cent, respectively.

It is emphasized in conclusion that in order to produce uniform sauerkraut of good quality consideration should be given to such factors as the kind of cabbage, kinds of bacteria, and conditions favoring the development of the proper bacteria.

Factors which influence the quality of sauerkraut, E. LeFevre (*Canner, 58 (1924), No. 11, II, p. 121*).—In this general discussion the factors considered chiefly responsible for influencing the quality of sauerkraut are acid content, temperature of fermentation, amount of salt, and quality of the cabbage. It is considered that the final acidity should be at least 1.5 per cent, the temperature during fermentation about 30° C. (86° F.), and the salt concentration about 2.5 per cent.

Contribution to the behavior of calcium, potassium, chlorin, and phosphorus in milk and to the technique of ultrafiltration [trans title], C. Wha (*Biochem. Ztschr., 144 (1924), No. 3–4, pp. 278–284, figs. 2*).—Data are reported on the amount of dialyzable calcium in milk as determined by prolonged dialysis and subsequent analysis and of the dialyzable and nondialyzable chlorin, potassium, phosphorus, and calcium in milk as determined following ultrafiltration in a special form of vacuum dialysator.

A comparison of the analyses of undialyzed and dialyzed milk showed that chlorin and potassium exist in an ionizable and diffusible form, while at least 50 per cent of the calcium and 60 per cent of the phosphorous is in a nondiffusible form. On acidifying milk the calcium becomes completely ionized and diffuses through the ultrafilter.

The estimation of lactose by the polarimetric and gravimetric methods, A. L. Bacharach (*Analyst, 48 (1923), No. 572, pp. 521–528 figs. 3*).—This paper reports a redetermination of the polarimetric constants of lactose and an application to the determination of lactose of the modified Fehling method proposed by Quisumbing and Thomas (E. S. R., 46, p. 113).

The corrected polarimetric constants are

$$[\alpha]^t_D = 52.40 + (t-20) \times 0.072 \text{ and}$$

$$[\alpha]^t_{\lambda=546} = 61.94 + (t-20) \times 0.085.$$

The method of Quisumbing and Thomas was found satisfactory, and has been introduced for routine gravimetric sugar determinations.

Estimation of fat, lactose, and moisture in dried milks, H. Jephcott (*Analyst, 48 (1923), No. 572, pp. 529–535*).—This discussion is based upon the author's experience in the examination of over 25,000 samples of dried milk.

In regard to moisture determinations, attention is called to the hygroscopic nature of milk powders and the consequent necessity of keeping the samples in well-stoppered bottles and of using weighing bottles with well-fitting stoppers.

In the estimation of fat, the Soxhlet method gave variable and unreliable results. Concordant results were obtained with the Werner-Schmidt method if certain precautions in manipulation were followed. The Roese-Gottlieb method gave satisfactory results if carried out with care, but it was found difficult to obtain complete solution of the milk powder in some cases. The U. S. Department of Agriculture modification of the Roese-Gottlieb method gave considerable and variable saponification of the fat, with results as much as 2 per cent too low. For rough routine work the Gerber method, slightly modified, gave satisfactory results with properly standardized Gerber tubes.

In connection with determinations of lactose, the specific rotation of lactose was redetermined with the following results:

$$[\alpha]_{D}^{t}=53.86-0.072t \text{ and}$$

$$[\alpha]_{\lambda=546}^{t}=63.74-0.09t.$$

The method of Quisumbing and Thomas (E. S. R., 46, p. 113), modified by determining the copper gravimetrically as cupric oxid, was found to give consistent results.

Studies on the adulteration of butter [trans. title], N. CHARLIERS (*Ann. Gembloux, 29 (1923), No. 10, pp. 297-311, figs. 5*).—The author has applied the method described by Pichard for detecting adulteration of cacao butter (E. S. R., 49, p. 611) to the determination of the adulteration of butter with so-called neutral fat and with cacao butter. Curves are given for pure butter, neutral fat, cacao butter, and mixtures of butter with neutral fat or cacao butter in varying concentrations. An improved apparatus for making the determination is described and illustrated.

A modification of the Babcock test for the determination of fat in buttermilk, P. H. TRACY and O. R. OVERMAN (*Illinois Sta. Bul. 248 (1924), pp. 64-70*).—Previously noted from another source (E. S. R., 50, p. 10).

A cheese factory test for critical degrees of acidity, J. L. SAMMIS and F. SANTSCHI (*Jour. Dairy Sci., 7 (1924), No. 1, pp. 83-85, fig. 1*).—The authors suggest as a rapid method for determining the appearance of lactic acid in whey in the process of Swiss cheese making a colorimetric H-ion concentration test. To 1 cc. of the well-mixed whey in a test tube is added 1 or 2 drops of an 0.01 per cent solution of bromocresol purple. As long as the whey is sweet the color remains purple, but at the point of initial acid development the color becomes gray and later yellow. The change to gray is the critical point for Swiss cheese, and to yellow for American cheese. It is considered that the color test is of distinct value in cheese making, although it can not replace the acidimeter in testing starters and other products of high and variable acidity.

[The effect of fineness of grinding the sample on determinations of fat and crude fiber], R. F. KORFHAGE (*Minn. State Dairy and Food Comn., Div. Feed Insp. Ann. Rpt., 4 (1922), pp. 32-38*).—Data are reported on the fat and crude fiber content calculated to the dry basis of two samples of bran unground and ground to pass 10-, 20-, 30-, 50-, and 60-mesh sieves, and of samples of alfalfa meal and beet pulp unground and ground to 50-mesh. Six determinations were made on each sample.

The results obtained showed in general an increase in the figures for fat and a decrease for fiber, with increasing fineness up to the 60-mesh, when the results became variable and inconsistent. Considerable differences were exhibited by the various materials in regard to the effect of fineness of grinding, but the results as a whole are thought to justify the recommendation that all feed samples on which fat and fiber are to be determined should be ground to pass at least the 50-mesh but not the 60-mesh sieve.

A rapid simple procedure for estimating small amounts of glucose in the urine in diabetic cases as a guide to insulin therapy, J. R. WILLIAMS and G. U. CASEY (*Med. Jour. and Rec., 119 (1924), No. 5, pp. 237-239, figs. 3*).—This is an adaptation of the Benedict method (E. S. R., 25, p. 15), as simplified by Joslin, for the use of nurses. The procedure is simplified still further by the use of a special pipette graduated both in tenths of a cubic centimeter and in minims and of 3 cc. and 50 minims capacity and by the use of a table of sugar values obviating some of the mathematical calculations. The authors recommend the use of 15 cc. of Benedict's quantitative reagent with the minim scale as the unit of measurement, but the table is so arranged that either this or the original Benedict method may be used.

A rapid method for the analysis of soap powder, F. F. FLANDERS and A. D. TRUITT (*Indus. and Engin. Chem., 15 (1923), No. 12, p. 1232*).—The method described is based upon the titration of total alkali, with subsequent extraction and titration of the fatty acids in chloroform solution with N/10 sodium ethylate. This is prepared by dissolving 2.3 gm. of cleaned metallic sodium in 1 liter of absolute alcohol and standardizing against hydrochloric acid with phenolphthalein as indicator. The fatty acids are titrated while hot with 1 per cent alcoholic solution of phenolphthalein as indicator.

Relation of the degree of contamination to sterilization, J. R. ESTY (*Canner, 58 (1924), No. 11, II, pp. 102-104*).—Data are presented and discussed showing that spoilage of canned peas and corn is materially increased with increase in the number of bacterial spores present. With the same amount of contamination, spoilage is materially reduced by increasing the time of processing at any temperature.

Flour manufacture, C. H. BAILEY (*Indus. and Engin. Chem., 15 (1923), No. 12, pp. 1217, 1218*).—A brief discussion of the various processes involved in the manufacture of wheat flour and of the criteria of flour grades.

Flour and bread as colloid systems, R. A. GORTNER (*Indus. and Engin. Chem., 15 (1923), No. 12, pp. 1218, 1219*).—A brief discussion of colloidal phenomena in bread making.

Uses of waste materials, A. BRUTTINI (*London: P. S. King & Son, Ltd., 1923, pp. XX+367, figs. 95*).—This is an English edition of the volume previously noted (E. S. R., 47, p. 612).

SOILS—FERTILIZERS.

The capillary distribution of moisture in soil columns of small cross section, W. W. MCLAUGHLIN (*U. S. Dept. Agr. Bul. 1221 (1924), pp. 23, figs. 7*).—Studies conducted at intervals over a period of six years on the distribution of moisture in soil columns of small cross section are reported. Previous studies dealt with comparatively large columns (E. S. R., 43, p. 722).

It was found that the moisture was not distributed at a uniformly decreasing rate with height above the water table. The maximum percentage of moisure occurred at an appreciable distance above the water table, varying from one-seventh to one-fourth the height of the moist part of the column. In some cases the second fourth of the column from the bottom contained as much or nearly as much as the bottom fourth.

In all tests extending over a period of 10 days or longer, except those with Idaho sandy soil, the lower half of the tube contained more moisture at all points than the average amount contained throughout the column. The average percentage of moisture occurred at points varying from the middle to two-thirds the height of the column. There was a considerable length a few inches above the water in all columns containing approximately the same percentage of moisture. Various methods of packing the soil columns and the facility with which air may escape from or enter into the soil column did not appear to alter the general plan of moisture distribution. Ventilated soil columns had a slightly more uniformly varying moisture content with height above water than did the columns not ventilated.

Experiments with horizontal soil columns of small area and having a vertical rise of 4 in. before a change to horizontal showed that the maximum percentage of moisture occurred close to but not necessarily at the end of the tube nearest the water. The average percentage of moisture in the tube was found at a distance from the water equal to more than half the length of the tube. The distribution of moisture was altered when the moisture reached the outer end of the tube.

In tubes inclined downward from the horizontal the greatest percentage of moisture was found at the top of the tube when gravity and capillarity were both acting. The total quantity of water which could be retained by the soil column by capillarity in the absence of ground water was much less than capillary saturation. These results are taken to indicate that if the downward movement of capillary moisture be checked by an impervious stratum, the distribution of moisture above this stratum will in time be similar to the distribution of moisture in a vertical column extending upward from this stratum and with a water table at the stratum.

Aqueous vapor pressure of soils.—II, Studies in dry soils, M. D. THOMAS (*Soil Sci., 17 (1924), No. 1, pp. 1–18, figs. 3*).—In a second contribution from the Utah Experiment Station (E. S. R., 46, p. 18), studies on aqueous vapor pressure in dry soils as it is influenced by their chemical composition, size distribution, and previous treatment are reported.

The vapor-pressure-moisture curves of a comprehensive series of soils, ranging from fine sands to tight clays and from highly calcareous to highly siliceous materials, were investigated at comparatively low moisture contents, with special reference to the influence on the curves of wetting and drying the soils. Mechanical and chemical analyses of these materials showed that the dynamic and static methods of measuring vapor pressure give identical results. The chemical composition of these soils, which were generally deficient in organic matter, was found to be a minor factor in its influence on the absorption of water.

The vapor-pressure-moisture function was found to depend upon the previous history of the soil. Drying was particularly effective in raising the vapor pressure at a given moisture content, the extent of this action depending upon the completeness of the drying. This effect was reversed by protracted contact with moderate amounts of water or shorter contact with an excess of water. The mechanical analyses also indicated that drying the soil made the texture appear coarser.

When comparable vapor-pressure-moisture curves were considered, all of the soils could be divided into two groups in each of which the relative amounts of hygroscopic water remained nearly constant over the range from 10 to 95 per cent of the vapor pressure of water. Changes in the slope and position of the curves due to wetting and drying did not change the relative hygroscopicities. These ratios of the hygroscopic water agreed closely with the ratios of the surfaces, as determined by mechanical analyses, of the particles larger than from about 0.1 to 0.25 μ radius, disregarding the smaller material.

The thickness of the moisture film agreed well with the corresponding value calculated from Oden's data (E. S. R., 48, p. 117), but was much smaller than the value found by Patten and Gallagher (E. S. R., 19, p. 1118). The theory underlying the method of Rodewald and Mitscherlich (E. S. R., 15, p.

847) for estimating the total surface of a soil from the hygroscopicity was not confirmed.

It is thought that the vapor-pressure-moisture function will probably furnish a means of studying the influence of soluble salts on the structure of soils. The data are thought to confirm the theory of the colloid-coated particle developed by Keen (E. S. R., 43, p. 20) and Comber (E. S. R., 44, p. 508).

Soil aeration, A. and G. L. C. Howard (*Agr. Research Inst., Pusa, Sci. Rpts. 1922–23, pp. 19, 20*).—Studies are briefly reported which showed that both dilute sulphuric acid and sulphur gave better results than superphosphate in improving soil aeration following a season of normal rainfall. The falling off in permeability following normal rainfall is attributed to the formation of colloids in the soil, and the improvement of aeration by these methods is apparently due to the action of the weak acids on these colloids.

[Soil studies at the Tennessee Station], C. A. Mooers (*Tennessee Sta. Rpt. 1920, pp. 14, 15*).—Five years' studies on the comparative influence of various forms of lime on the content of humus and nitrogen in the soil are said to have indicated a conservation of soil nitrogen where a crop of tall oat grass covered the ground the year round. The losses of soil nitrogen under all other conditions, including those where cowpeas were grown in the summer but with no crop in the winter, were very large. Another important result was the marked increase in loss of nitrogen under liming, particularly where burnt lime was used. Ground limestone was found to equal practically the burnt lime so far as crop increase was concerned, but without bringing about the serious loss of soil nitrogen induced by the various forms of burnt lime.

Lysimeter studies showed conclusively that lysimeters of different depths are required in order to get an accurate record of what is taking place.

[Soil chemistry studies at the Tennessee Station, 1919], W. H. MacIntire (*Tennessee Sta. Rpt. 1919, pp. 11, 12*).—Studies of sulphur conservation in soil as influenced by lime and magnesia and on the decomposition of calcium and magnesium carbonates in soils under field and drainage conditions are briefly summarized, which have already been noted from other sources (E. S. R., 38, p. 327; 42, p. 127).

[Soil chemistry studies at the Tennessee Station, 1922], W. H. MacIntire (*Tennessee Sta. Rpt. 1922, p. 21*).—Lysimeter studies over 8- and 5-year periods on the losses of calcium, magnesium, potassium, sulphur, and nitrogen from soils treated with different calcic and magnesic materials at different rates are briefly summarized, which have been previously noted from other sources (E. S. R., 50, pp. 521, 523).

Reciprocal repression exerted by calcic and magnesic additions upon the solubility of native materials in surface soil, W. H. MacIntire, W. M. Shaw, and J. B. Young (*Soil Sci., 16 (1923), No. 6, pp. 449–464*).—Leaching data from 22 lysimeters over a 5-year period are reported from the Tennessee Experiment Station. Limestone, dolomite, calcium oxid, and magnesium oxid unsupplemented were added in amounts equivalent to 2,000 lbs. of calcium oxid per 2,000,000 lbs. of soil. Calcium oxid and magnesium oxid were also used unsupplemented at the rate of 3,750 lbs. At the same rate and also at the 32-ton rate the two oxids were used with a 1,000-lb. constant of sulphur added as ferrous sulphate, pyrite, and elementary sulphur.

The addition of limestone increased the loss of calcium and had no positive effect upon magnesium, while the addition of dolomite decreased the loss of calcium and increased that of magnesium. Both of the calcium oxid additions increased the calcium losses and decreased those of magnesium. Both magnesium oxid additions had the opposite effect.

Ferrous sulphate alone increased the calcium and magnesium losses, and when supplemented with the smaller calcium oxid additions it doubled the loss of calcium. The unsupplemented pyrite had the same effect as ferrous sulphate upon native calcium and magnesium. Sulphur alone increased the losses of both calcium and magnesium in very much the same manner as ferrous sulphate and pyrite.

The effect of soil suspensions upon the solubility of the sulphate radical in the system $Ca(OH)_2$—$CaSO_4$—H_2O, W. H. MacIntire and W. M. Shaw (*Soil Sci., 17 (1924), No. 1 pp. 65–89*).—Studies conducted at the Tennessee Experiment Station on the influence of calcium hydroxid on the retention of sulphates by soils are reported.

Additions of calcium hydroxid to aqueous ferrous sulphate soil suspensions gave decreasing alkalinity and increasing sulphate recoveries for 24- and 48-hour day and 16-day intervals of periodic agitation. Agitation of 6 aqueous ferrous sulphate-calcium hydroxid suspensions, 3 with periodic agitation and no aeration, and 3 with constant agitation induced by aeration, showed a progressive increase in the amounts of sulphates unrecovered for increase in lime charges under both conditions.

The influence of soil structure and the occurrence of hydrated ferric and aluminum oxids and silica as causative factors in the absorption of sulphates by the soil in the presence of calcium hydroxid were considered between soil and soil-sodium sulphate suspensions and similar suspensions of ignited soil. After 48 hours the unfortified ignited soil gave a sulphate extraction more than double that of the control. The sulphate recoveries from the fortified control were greater for both periods than those from the fortified ignited residue. The calcium hydroxid addition was much more active upon the fortified ignited residue than upon the fortified soil in causing increased absorption.

A comparison between sulphate recoveries obtained by agitation and extraction of soil with large proportions of water and those obtained by rainfall leachings showed that the extracted sulphates from the air-dried reserve were in excess of those leached during 4- or 5-year periods, in spite of the additional soluble sulphate added by rainfall.

The effect of plants on the concentration of drainage water from the Cornell lysimeters, B. D. Wilson (*Soil Sci., 16 (1923), No. 6, pp. 427–432*).—Studies conducted at Cornell University on the concentration of the leachings from certain planted and unplanted lysimeters over a period of three years to indicate the effect of plants on the concentration of the drainage water from two distinct types of soil are reported.

The average concentration of percolates from bare soils was considerably higher than that from soils which had been under rotation. This was true not only during the growing period of the plant, but it continued to be greater year after year. The point of lowest concentration for the bare soil percolates each year was greater than the highest concentration for the soil planted to a crop rotation.

The data tend to prove that an immediate restoration of equilibrium when the soil solution is depleted of its soluble material never occurs as long as a crop is allowed to grow on the soil for a portion of each year. The nitrate nitrogen was always more concentrated in the drainage from the bare soil than in that from the cropped soil. The concentrations of the percolates were more or less independent of the amounts of water which passed through the soil. In most cases the concentrations of the percolates decreased as the seasons progressed from the month of May, but they regained their former strengths with each succeeding year.

The results are taken to indicate (1) that the concentration of the percolates from lysimeters is not dependent upon the quantity of water leaching through the soils, and (2) that the different soil treatments bring about a condition within the soils which causes them to liberate their soluble material in a more or less characteristic way.

Comparison of the soil solution by displacement method and the water extract of alkali soils, P. L. Hibbard (*Soil Sci., 16 (1923), No. 6, pp. 465–471*).—In studies conducted at the California Experiment Station, nine different alkali soils were examined by the water extraction and displacement methods, and the analytical results on the two solutions thus obtained were compared.

The data indicated that the water extract does not represent the actual conditions in the soil. Carbonate, bicarbonate, and phosphate were greatly overestimated in the water extract. Chlorin, nitrate, and sodium may be approximately correct, sulphate and potassium are likely to be much overestimated, and calcium or magnesium may be either high or low. It was also found that the actual concentration of solutes in the true soil solution may be much greater than is generally realized by one accustomed to thinking in terms of the amounts found in 1:5 water extracts.

The geochemical classification showed that the water extracts contain relatively larger proportions of sodium salts and less of calcium and magnesium salts than the true soil solution. The latter made the soil appear more favorable for plant life than did the water extraction method.

Studies on virgin and depleted soils, C. E. Millar (*Soil Sci., 16 (1923), No. 6, pp. 433–448*).—Studies conducted at the Wisconsin Experiment Station on 48 depleted soils and the corresponding virgin soils to determine the actual changes which a soil undergoes in passing from a virgin to a depleted condition are reported.

Virgin soils showed a greater rate of solubility than the depleted soils, as measured by the freezing point method, when maintained at 25° C. with a moisture content somewhat above saturation. The rather general conclusion is drawn that a decrease in the rate of solubility is one of the important changes a soil undergoes in passing from a virgin to a more or less depleted condition. An equal or greater rate of solution was observed in several soils after removal of the organic matter by treatment with hydrogen peroxid than in the untreated samples, and the difference in the rate of solubility between cropped and virgin soils from which the organic matter had been similarly removed was generally greater than in the untreated samples. These results led to the conclusion that the larger supply of organic matter generally present in virgin soils may not necessarily be the cause of their greater rate of solubility.

The solubility of a number of subsoils was found to be very low as compared with the surface soils. It was also found that subsoils from depleted areas had as great a solubility as those from the corresponding virgin soils. This led to the conclusion that most crops feed primarily in the surface or plowed stratum of the soil. With one exception, cropped soils maintained for three weeks at room temperature with a moisture content somewhat above saturation yielded more sulphates, while virgin soils yielded the larger amounts of iron, aluminum, calcium, and magnesium. Phosphates and chlorids were yielded in larger quantities by the virgin soils in some cases and by the cropped soils in others.

By the use of the displacement method, a fair correlation was noted between the amounts of calcium and phosphorus in the soil solution from several silt loams and the response of plant growth to the addition of these elements. The data for sandy soils did not show such a good correlation, and little or no correlation of this nature was found in the case of several peat soils. The amounts of potassium in the solutions showed little relation to the response of plant growth to the addition of potassium in any of the soil classes.

When the soils were extracted with 3 parts of water to 1 of soil by weight with a period of contact of 18 days, fair correlations were observed in so far as phosphorus and calcium were concerned in both the silt loam and sandy classes. More consistent relations with respect to potassium were also found than when the displacement method was used. The results for the peat soils showed practically no correlation. The total amounts of material found in the extracts agreed quite well with the growth of alfalfa produced on the check pots.

When the soils remained in contact with larger proportions of water for 20 hours, the total amounts of material extracted showed a marked correlation with the yields of alfalfa produced on the untreated soil. In cases where comparatively large amounts of calcium went into solution but only small amounts of phosphorus and potassum, the growth of alfalfa was quite satisfactory, thus indicating that a highly available lime supply may render small amounts of these elements adequate. The data as a whole are taken to indicate that the rate at which various materials are given up by soils is a very important factor in determining their crop-producing capacity.

Report on soils and fertilizers, W. T. McGeorge (*La. Planter, 72 (1924), No. 14, pp. 272–274, fig. 1*).—In a contribution from the Hawaiian Sugar Planters' Experiment Station, a summary is made of the activities and developments in research on sugar cane soils of the Hawaiian Islands and fertilizer practices during the past year.

[Soil bacteriology studies at the Tennessee Station], M. Mulvania (*Tennessee Sta. Rpt. 1916, p. 9*).—In studies to determine proper sources of carbon for Azotobacter, carbon dioxid was not found to serve as such a source of supply. When carbon dioxid gas was passed over the cultures after purification they failed to grow in every case.

Studies on the production of dialyzable nitrogen by the legume bacteria showed that where a dialyzing membrane intervened between the bacterial culture and the roots of the plant no infection of the roots took place. Under the conditions of the experiment the seeds germinated well, and the young plants grew for a short time but soon showed lack of proper nourishment. At the end of three weeks they were all dead. Other plants, grown under the same conditions except that nitrates were supplied, grew much longer and showed none of the signs of lack of nourishment noticeable in those where the nitrogen supply, if secured, must come from the bacterial culture alone. This indicated clearly that no usable dialyzable nitrogen was assimilated by the bacteria.

In studies on the influence of organic acids on the rate of decay of straw and cottonseed meal in cylinders containing washed extracted sand, the evolution of carbon dioxid was increased in almost every case by the presence of such acids in moderate percentages. Molds grew abundantly and colonized at the surface of the sand just inside the glass cylinders. The colonies were definite and of limited size, indicating that there was not a uniform distribution of the molds throughout the medium. This is taken to indicate that present methods of taking soil samples for bacterial analysis are far from satisfactory.

Soil flora studies, T. L. Martin (*Soil Sci., 16 (1923), No. 6, pp. 475–477*).—Studies conducted at Brigham Young University on the effect of green manure at different stages of growth on the three distinct groups of organisms common to an ordinary soil are reported. Rye, oats, and buckwheat were harvested at three different stages of growth and incorporated with clay loam soil in pieces about 1 in. in length at the rate of 5 tons of green manure per acre.

Counts made of Actinomyces, spore-formers, and nonspore-formers indicated that the nonspore-formers are in the majority in a normal soil. The addition of green manures usually increased the total number of organisms. In general the younger the manure added the greater were the numbers of Actinomyces developed in proportion to other organisms. Spore-formers were influenced proportionately less than the others, while the Actinomyces group was influenced to the greatest extent. The results are taken to indicate that perhaps the particular function of the Actinomyces group of organisms is that of cellulose decomposition.

The movement of nitrates in the soil and subsoil, W. H. Harrison (*Agr. Research Inst., Pusa, Sci. Rpts. 1922–23, pp. 29–31*).—Continuing studies previously noted by Hutchinson (E. S. R., 49, p. 210), data from 1,290 samples of soil are summarized, indicating that from the point of view of conservation of nitrate the best types of soil are those which possess a fairly heavy layer from 3 to 4 ft. deep. Data from a field which had received a heavy application of green manure showed that after decomposition the large amount of nitrate formed had been carried down into the deeper layer, and subsequent borings showed that the cold weather crop obtained little benefit from it until late in the season. On this basis green manuring during the earlier stages of the monsoon was considered of questionable benefit.

The available phosphate of calcareous soils, W. H. Harrison (*Agr. Research Inst., Pusa, Sci. Rpts. 1922–23, pp. 27–29*).—Studies to discover a solvent for phosphoric acid in calcareous soils which, while extracting an appreciable amount of phosphoric acid, is not naturally affected by the presence of varying amounts of calcium carbonate are reported.

In the vast majority of cases it was found that mixtures of calcium carbonate in different amounts exerted a marked depressing effect upon the extraction of phosphoric acid by different solvents. It was found, however, that extraction with solutions of alkaline carbonates very closely met the conditions laid down, and that a 1 per cent solution of potassium carbonate was the most convenient for general employment.

Comparisons made between soils from different portions of the Pusa estate showed that although the total phosphoric acid did not vary appreciably and the available phosphoric acid estimated by the citric acid method was uniformly lower than 0.0005 per cent, the amount extracted by potassium carbonate varied from about 0.0011 to 0.00321.

Further experiments showed that it was possible to differentiate between manured and unmanured plats by extraction with potassium carbonate. Examinations made of soils showing very irregular growths of crops showed that in three cases out of four the good soils yielded appreciably higher values than the poor soils with potassium carbonate extraction, while with citric acid extraction the reverse was the case.

The replacement of soil potassium, S. C. Vandecaveye (*Soil Sci., 17 (1924), No. 1, pp. 91–96*).—Studies conducted at the Iowa Experiment Station to determine the replaceable potassium in sterile and nonsterile Carrington loam soil receiving varying applications of clover hay and manure are reported.

About 90 per cent of the absorbed potassium of the loam was replaced by two extractions with normal ammonium chlorid. The application of organic matter such as clover hay and manure resulted in the liberation of considerable quantities of replaceable potassium from the soil. This liberation increased in proportion to the increased amounts of organic matter applied. The clover hay seemed to liberate more replaceable potassium than manure in both sterile and nonsterile soils.

The carbon dioxid production and the biological activities showed no relation to the liberation of replaceable potassium. Sterilization had no effect on the replaceable potassium, but the sterilized soils liberated more soluble potassium than the unsterilized soils. The liberation of replaceable potassium appeared to be largely a chemical process which seemed to proceed in the absence of biological factors.

Some factors affecting the growth of crops on acid soils, S. D. CONNER (*Indus. and Engin. Chem., 16 (1924), No. 2, pp. 173–175*).—Studies conducted at the Indiana Experiment Station are reported, the results of which are taken to indicate that the soil acidity determined by the Hopkins potassium-nitrate method is largely mineral in nature. That determined by the Jones calcium-acetate method is considered to be total acidity. The square of the mineral acidity divided by the organic acidity gives an index which appears to be a better indication of the lime requirements of both organic and inorganic soils than any single method can give.

Pot experiments on acid soils showed that the toxicity of soil acidity may be due to both aluminum and H ions. Some crops, such as corn and radishes, were more sensitive to aluminum ions than to H ions, while other crops, such as red clover and beets, were more sensitive to H ions. It is concluded that both phosphates and lime are needed to correct the toxicity of aluminum and H ions in most acid soils.

The peat bogs of Sweden and the Swedish Peat Society, H. WITTE (*Jönköping: H. Halls Boktryck.-Aktblg., 1923, pp. 24, figs. 10*).—A brief review is given of the peat bogs of Sweden and their importance, and the organization, historical development, and objects of the Swedish Peat Society are discussed. Brief descriptions are included of the experiment station and experimental garden of the society at Jönköping and of the experimental farms at Flahult and Gisselås.

[Tillage experiments at the Tennessee Station], C. A. MOOERS (*Tennessee Sta. Rpt. 1919, p. 8*).—Recent experiments are said to have shown that plowing may be dispensed with under some conditions without reduction in yield of the following crop. For instance, land that is free from trash and is loose in the spring may not require the use of a turn plow for a cotton crop, but can be put into the best condition by the disk harrow alone. Considerable evidence is also said to be available to show that extra deep plowing is not profitable under average soil conditions even for a crop like corn.

Influence of the incorporation of manure on soil temperature [trans. title], A. PETIT (*Jour. Agr. Prat., n. ser., 40 (1923), Nos. 46, pp. 389, 390; 47, pp. 416–418*).—Experiments on the incorporation of straw in soil showed that the temperature of soil thus treated is lower in its surface layer in the morning and higher in the evening than that of untreated soil. The radiation of heat from the surface layer of treated soil during the night seemed to increase as the proportion of straw incorporated was increased. This is taken to indicate a possible injury by frost which sensitive crops may suffer in soil in which straw has been incorporated.

Experiments on the incorporation of horse manure in soil showed, on the contrary, that such soil was warmer in the morning than untreated soil. The surface layer of soil treated with horse manure cooled more rapidly and the subsurface layers more slowly during the night than the corresponding layers of untreated soil. Soil rich in humus was found to be warmer in its surface layers during the day and cooler in its subsurface layers than soil not so well supplied with humus. During the night the order of temperatures was reversed.

These results are taken to indicate that the more rapid cooling of soils rich in humus during the night is favorable to frost injury of crops. A moderate use of organic fertilizers is suggested when there is danger of frost.

The value of fermented green manures as tested at Pusa by the prevalued plat method, C. M. Hutchinson (*Agr. Jour. India, 18 (1923), No. 3, pp. 219–237*).—Studies begun in 1917 in the Punjab experimental area of the Pusa farm to determine the value of green manuring with sunn hemp, used either in the ordinary manner by plowing in green or after fermentation heaps, are reported. The value of using superphosphate in conjunction with green manure was also studied. Concentrations of soil and green manure of 3:1 and 6:1 were used.

Increases in the yield of different crops were obtained with both concentrations. With some crops, notably oats, the higher concentration gave no greater increase than that obtained with the lower one. On the other hand, the higher concentration showed much greater increases in the yield of maize than the lower. It was further found that although superphosphate alone had but little effect upon the oat crop, when used in conjunction with organic residues the increase was considerable and rose in proportion to the amount of organic matter added to the soil. In this combination the great value of the higher concentration of fermented green manure was obvious. It was also shown that in the presence of adequate supplies of organic matter applications of superphosphate not only maintained their effectiveness in the first season but had a considerable residual effect over several years.

The data as a whole are taken to indicate that bacterial action is capable of dissolving tricalcic phosphates, and that this action depends upon the presence of organic matter. The general conclusion is drawn that the effectiveness of superphosphate as a manure in these soils depends largely upon bacterial intervention, and that the persistence of this effect is to some extent due to the formation of relatively available organic phosphorus compounds by bacterial action.

Chemical fertilization in Italy [trans. title], F. Zago (*Atti R. Accad. Georg. [Florence], 5. ser., 20 (1923), No. 2–4, pp. 52–92*).—The nitrogenous, phosphatic, and potassic fertilizers available in Italy are discussed, and information is given on their specific actions under different conditions and on their proper use for different crops on Italian soils. Data are also included on fertilizer consumption on different types of culture in the various Italian provinces.

Influence of varying ratios of phosphoric acid and potash on crop yield and nitrogen recovery, A. W. Blair and A. L. Prince (*Soil Sci., 17 (1924), No. 4, pp. 327–331, figs. 2*).—Studies conducted at the New Jersey Experiment Stations are reported which showed that as a whole a ratio of 1:2 for nitrogen and phosphoric acid gave somewhat better yields of corn than a ratio of 1:1 or 1:3. Neither the amount of phosphoric acid used nor the form of nitrogen perceptibly influenced the nitrogen in the dry matter.

On the other hand, the form of nitrogen had a very pronounced influence on the crop yields and consequently on the percentage of nitrogen recovered in the crop. With sodium nitrate the average recovery was about 43 per cent, with ammonium sulphate it was close to 30 per cent, and with dried blood a little over 20 per cent. When the nitrogen was taken in equal amounts from three sources, the average recovery was slightly better than when ammonium sulphate was used alone.

The recovery calculated on the basis of two crops was higher than with one crop. This is taken to indcate a conservaton of nitrogen, since much of what was taken up by the second crop would otherwise have been lost.

The nitrogen industry, J. R. Partington and L. H. Parker (*London and Bombay: Constable & Co., Ltd., 1922, pp. XV+336, pls. 19, figs. 23*).—This is a comprehensive survey of the nitrogen-producing industry covering nitrogen products and Chile nitrate, by-product ammonia and ammonium sulphate manufacture, and nitrogen fixation processes, including the synthetic ammonia, cyanamid, arc, and oxidation of ammonia processes.

The industrial prospects of atmospheric nitrogen fixation in South Africa, J. White (*So. African Jour. Indus., 7 (1924), No. 3, pp. 138–147*).—The benefits of an atmospheric nitrogen fixation industry in South Africa are enumerated and discussed, and a brief bibligraphy is included.

Phosphates and improvement of pasture, G. S. Robertson (*[Belfast]: North. Ireland Min. Agr. [1923], pp. 9*).—A summary is given of the results of experiments from different sources on the use of phosphates, particularly basic slag, on pasture soils of Northern Ireland. Attention is drawn especially to the beneficial influence of basic slag not only on grasslands but on the development of wild white clover in permanent pasture.

Value of some silicate rocks for potassic fertilization [trans. title], E. Monaco (*Italia Agr., 60 (1923), No. 6, pp. 234–240*).—Analyses of some of the more important potash-bearing silicate rocks of Italy showing their potassium contents are presented, and their use as fertilizers directly and after chemical treatment is briefly discussed.

The leucites and leucitic tuffs seem to be the most important of these. The volcanic tuffs, while having a lower total potassium content than other materials, generally show a higher available content.

A bibligraphy is appended.

Studies on Sulphur oxidation in Oregon soils, W. V. Halversen and W. B. Bollen (*Soil Sci., 16 (1923), No. 6, pp. 479–490, figs. 2*).—Studies, conducted at the Oregon Experiment Station with samples of 14 soil types representative of four distinct areas of Oregon, to determine any relation that certain factors connected with the sulphur supply and sulphur transformation in a soil may have to the response obtained from sulphur fertilization, are reported.

All of the soils studied were capable of oxidizing sodium sulphid and flour of sulphur, While there was considerable variation in the sulphur-oxidizing efficiencies of different soils, all appeared to oxidize enough sulphur to supply the needs of crops within a comparatively short time. A general relation existed between sulphur-oxidizing power and sulphate content. No relation was apparent between total sulphur content and sulphur-oxidizing power or between total sulphur content and sulphate content.

The application of sulphur to a soil tended to increase the sulphur-oxidizing efficiency of that soil. Inoculated sulphur stimulated sulphur oxidation, but its need was not indicated in the soils studied. An increase in either temperature or aeration tended to increase the rate of sulphur oxidation. The heavy soils showed a marked ability to neutralize the acidity resulting from sulphur oxidation. Soils having high buffer values were heavy soils in which sulphur oxidation was slow as compared with the light sandy soils of low buffer values. No apparent relation existed between the H-ion concentration and the sulphur-oxidizing power of a soil.

AGRICULTURAL BOTANY.

Physiological studies in plant anatomy, I–VI (*New Phytol., 21 (1922), Nos. 2, pp. 58–80; 3, pp. 113–139, figs. 5; 4, pp. 210–229, figs. 2; 5, pp. 252–268, fig. 1; 22 (1923), No. 1, pp. 30–44*).—These physiological studies in plant anatomy cover the five phases indicated below:

I. *Introduction*, J. H. Priestley (pp. 58–61).—Regarding the series of data marshaled by Haberlandt (E. S. R., 31, p. 728) rather as anatomical contributions to the understanding of plant physiology than as contributions made by physiology to plant anatomy, the author holds that any real explanation of structure must wait until its development has been traced and interpreted in terms of physico-chemical causation. Such developmental studies will require an extensive reinvestigation of the problems of anatomy, undertaken largely from a physiological point of view, and it is in this sense that the series of papers noted below may be regarded as physiological studies in plant anatomy.

II. *The physiological relation of the surrounding tissue to the xylem and its contents*, J. H. Priestley and D. Armstead (pp. 62–80).—An account has recently been given (E. S. R., 46, p. 431) of a theory of the mechanism by which exudation pressure may be developed by a root system. In the present paper some fresh experimental evidence is presented which is relevant to this theory, and the experimental investigation is extended to the study of such exudation pressures in stem and leaf.

In this paper attention has been confined to the nature and conditions of the exchange of solutes between the xylem and the parenchyma around the vascular strand, and the results are given in some detail.

In the tree stems investigated the evidence obtained agreed with the conclusion of Dixon and Joly (E. S. R., 6, p. 506) that the highest value for the equilibrium concentration would be found in the xylem at the time that the leaf buds were bursting.

III. *The structure of the endodermis in relation to its function*, J. H. Priestley and E. E. North (pp. 113–139).—This paper presents an attempt to reinvestigate the microchemistry and structure of the endodermis to see how far the facts support the view recently advanced (E. S. R., 46, p. 431) as to its function in the plant.

Hitherto microchemical studies of the endodermis have been made mainly on sections of tissues. A method is described of using cylindrical strips of endodermis from *Potamogeton perfoliatus*, which has been found much more convenient.

The embryonal stage is not discussed. The primary stage is characterized by the presence of the Casparian strip, which consists of impregnating substances of various kinds, including derivatives of fatty acids and substances giving the reactions characteristic of lignified membranes. These are embedded in a basal wall substance which is of unknown composition. The unknown basal substance present in the Casparian strip is characterized by its great resistance to concentrated acids and alkalis. It contains some nitrogen but is not a protein. It is probably allied to the substance that occurs in the cell membranes of the apical meristems of many roots. Other structures are comparatively described.

Evidence is advanced for the presence of a basal substance of unknown composition in the suberin lamella, but differing from that occasionally present in the Casparian strip in its solubility in strong sulphuric acid. The suberin lamella renders the secondary endodermis relatively very impermeable both to water and solutes, except when passage cells are present. Experimental evidence for this conclusion is given.

The conclusions reached in this paper are said to be in harmony with the views expressed in earlier papers as to the part played by the endodermis in the development of exudation pressures. Some of the consequences of applying these considerations to problems of physiological anatomy are indicated by a brief discussion of the physiological relation of stelar strands to ground tissues in the Filicineae.

IV. *The water relations of the plant growing point*, J. H. Priestley and R. M. Tupper-Carey (pp. 210–229).—A recent investigation into the mechanism of exudation pressures exerted by the root (E. S. R., 46, p. 431) revealed the necessity for the presence of a tissue formation, throughout the root cylinder, which would be capable of supporting the pressure of the ascending water column without allowing serious leakage back to the surface of the root.

"Recent work upon the sap pressures existing within the vascular strand leads to the conclusion that the meristematic cap, closing the endodermal cylinder in the young root, must be relatively impermeable to water. It is shown experimentally that this meristematic cap will prevent the passage of water under a pressure of two atmospheres. This meristematic tissue is relatively impermeable to the diffusion of salts in solution and acid dyes but stains very readily with basic dyes. The impermeability of the living meristem is also confirmed by its high resistance to the passage of an electric current. The function of the protoplasts in protoplasmic synthesis is evidence for their impermeability to water. The stem apex allows relatively free diffusion of water and solutes within the cuticle, the meristematic protoplasts at the apex staining readily with acid dyes.

"The difference in permeability of these meristems is due to the composition of the walls. In the stem apex they are of cellulose, in the root apex they are of unknown substances which are probably in part converted into cellulose by boiling with potash. The sap contained in the endodermal cylinder of the root is apparently more acid than the sap irrigating the stem apex. This fact may be correlated with the retention of colloidal electropositive ions within the primary endodermis in explaining how in the root the apex obtains the amphoteric substances necessary to growth while the cortex receives very little. In the stem those same substances may bear a different charge, and escape more freely into the cortex as well as entering the apical meristem. The different staining capacities of the two apical meristems thus appear very significant.

"The relative ease with which the apical meristem of the stem is irrigated with substances, as compared with the supply of these substances to the root apex, is shown to suggest a physiological basis for the important morphological differences characteristic of these two growing points.

"The experimental results, summarized above, are in direct conflict with Coupin's recent work [E. S. R., 43, p. 730] on the function of the root apex. A critical examination of his experiments shows them to be inadequate support for his theory that the growing point is the chief organ of the root for the absorption of water and solute."

V. *Causal factors in cork formation*, J. H. Priestley and L. M. Woffenden (pp. 252–268).—"Cork formation has been studied from a generalized standpoint arising out of a study of the effect of the sap contained within the vascular strand upon the meristematic activity of the tissue supplied by these strands. Wound cork formation, the scar left at leaf fall and natural cork formation all show the following causal sequence; first, the blocking of a parenchymatous surface, usually by a deposit of suberin or cutin formed in presence of air; secondly, the accumulation of sap at the parenchymatous surface thus blocked; and thirdly, the consequent development and activity of a phellogen amidst this parenchyma. The pericyclic origin of a periderm must be attributed to the presence of a functional endodermal barrier when the phellogen is formed. Special cases, such as the general absence of periderm formation in the cortex of roots, in the axes of aquatic plants, and in leptosporangiate ferns, provide additional evidence for the correctness of the causal sequence stated above.

"In the case of cork formation in leaves experimental evidence is supplied to show that the meristem formation depends upon a sap pressure within the tissue. Further experimental evidence is also supplied, confirming previous statements to the effect that the preliminary suberization depends primarily upon air. It is further shown that if the parenchymatous surfaces are artificially blocked by experimental methods, a subsequent sap pressure may produce meristematic activity as a result of which tissues like normal periderm may be formed, save that the walls are not suberized."

VI. *Etiolation*, J. H. Priestley and J. Ewing (pp. 30–44).—"The plant may be regarded as a dynamic equilibrium between internal inherited factors and the external environment during development. The root and stem normally develop in very different environments; if these are reversed experimentally, an opinion may be formed regarding the extent to which the normal structure is determined by internal factors.

"If the root is grown in light and air relatively little structural modification can be seen. . . . But if the stem is grown in darkness very great structural modifications are produced; these are known as the phenomena of etiolation. Various types of etiolation are exhibited by plants of different growth habit, but in the . . . very common type exhibited by the broad bean and potato it is shown that . . . an explanation is possible in terms of causal anatomy on the assumption that when the stem apex grows under conditions more normal to the root apex, its development proceeds in a manner more characteristic of the root. Thus the walls between the protoplasts of the apical meristem remain relatively impermeable to the nutrient sap. The 'plumular hook' therefore persists, and meristematic tissue active in growth is only found below it. The rudiments of the lateral leaves and axillary branches therefore fail to develop further; these etiolated leaf rudiments are rich in protein, but lack water, carbohydrates and inorganic salts. Another consequence of the changed meristematic development is the production of a functional primary endodermis in the stem. To the presence of this endodermis may in part be attributed the reduced cortical development and the lack of angular or winged contours of the etiolated stems in cross section.

"Adventitious roots develop freely in the etiolated plant as the result of the distribution of the nutrient sap determined by the presence of the endodermis; there is good reason to think that a pericyclic periderm, as opposed to a normal periderm, may often arise as the result of the same factor. Owing to the depression of transpiration extension goes on in the etiolated plant equally by day and night; in the green plant extension goes on mostly by night. Earlier theories advanced to account for this particular group of etiolation phenomena are reviewed from the new standpoint, and some further experiments briefly described which do not support an alternative hypothesis that elongated growth in etiolation is due to the absence of a growth-inhibiting secretion formed by the chloroplasts in the light."

The composition of the cell wall at the apical meristem of stem and root, R. M. Tupper-Carey and J. H. Priestley (*Roy. Soc. [London], Proc., Ser. B, 95 (1923), No. B 665, pp. 109–131*).—In the present work the polar meristems of the shoots and roots, chiefly of *Vicia faba*, were studied with reference to the biochemical changes that proceed within the wall separating the protoplasts. It was intended to correlate and extend recorded observations so as to permit a detailed comparison to be made between the walls of the two types of polar meristem.

Differences in microchemical reaction between the apical meristems of the root and stem in the broad bean having suggested that a difference in chemical composition might exist and explain the difference in relative permeability found during the earlier investigation above noted, a detailed microchemical investigation of the reaction of the cell walls of the various meristems toward cellulose reagents followed, and this led to the classification into radicle, root, and plumule, etiolated stem, and normal green stem. Macrochemical experiments proved the existence of cellulose in the walls of the meristem, but its presence is masked by association with other substances.

Estimation of the amount of calcium present in the various meristems showed it to be greatest in the stem apex when grown in the light and least in the meristem of the radicle. It is assumed that the plant wall arises by gradual transition from a living protoplasmic interface to a structural system of relatively simple chemical compounds.

The tissue fluids of Egyptian and Upland cottons and their F_1 hybrid, J. A. Harris, Z. W. Lawrence, W. F. Hoffman, J. V. Lawrence, and A. T. Valentine (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 5, pp. 267–328, pl. 1, fig. 1*).—The authors present the results of an investigation of the physico-chemical properties of the leaf tissue fluids of Egyptian and Upland cotton as grown under irrigation at Sacaton, Ariz. Comparison was made of the properties of the leaf tissue fluids of the F_1 hybrid between these two cottons with those of the parent types.

The investigation was limited to osmotic concentration, specific electrical conductivity, and acidity in terms of H-ion concentration in the leaf tissue fluids of Pima Egyptian and of Meade and Acala Upland cottons and those of the F_1 hybrid between Pima and Meade cotton. The osmotic concentration of the leaf tissue fluids was found to be higher in Egyptian than in Upland cotton. The electrical conductivity of the leaf tissue fluids of Egyptian cotton is said to be significantly higher than that of either of the Upland cottons compared. The higher values of electrical conductivity are said to indicate that the Pima Egyptian cotton is capable of taking up from the soil and retaining in solution in the tissue fluids larger quantities of conducting electrolytes than the Upland cotton.

The ratio of specific electrical conductivity to freezing-point depression in general was somewhat higher in Egyptian than in Upland cotton. This is considered to suggest that the tissue fluids of the Egyptian cotton contain relatively, as well as absolutely, larger quantities of solutes capable of carrying the electric current than those of Upland cotton.

In comparing the sap properties of the F_1 hybrids between Pima and Meade with those of the two parents, it was found that the osmotic concentration and specific electrical conductivity of the hybrids in all cases were lower than those of either of the parent types. In general, the differences observed between the parent and hybrid forms increased later in the season.

The H-ion concentration of the hybrid was found to be higher than that of the Egyptian parent, but lower than that of the Upland parent, indicating that the hybrid is intermediate in acidity between the two parental forms.

Catalase activity in dormant apple twigs: Its relation to the condition of the tissue, respiration, and other factors, A. J. Heinicke (*New York Cornell Sta. Mem. 74* (*1924*), *pp. 3–33, fig. 1*).—In a previous publication (E. S. R., 49, p. 28) the author suggested that the rate of liberation of oxygen from hydrogen peroxid caused by the preparation of apple leaves may be taken as one of the indicators of the nutritive, or physiological, condition of that tissue. In the present publication a report is given of further studies conducted primarily to ascertain to what extent a simple catalase determination of apple bark will reflect the differences in the condition of dormant twigs or branches.

Summarizing the data, the author claims that catalase activity of the bark of dormant apple twigs agrees in general with similar data on apple leaves, and that catalase activity may serve as an indicator of the physiological responses of fruit trees to various cultural conditions or treatments.

The data in general are held to afford a basis for the suggestion that the presence of growth-producing substances favors catalase activity, while substances tending to inhibit vegetative activity have a retarding influence on the catalysis of hydrogen peroxid.

The effect of carbon dioxid on the tropic reactions of Helianthus stems, R. E. Chapman, W. R. I. Cook, and N. L. Thompson (*New Phytol., 23 (1924), No 1, pp. 50–62, pl. 1, figs. 4*).—Normal heliotropic response in carbon dioxid concentrations up to 40–45 per cent is shown by normal seedlings of *H. annuus*, and normal geotropic response is shown by normal and etiolated seedlings under the same conditions. Above 40–45 per cent of carbon dioxid, cessation occurs of growth and of response to gravity and light.

"The preliminary downward curvature of etiolated seedlings in all concentrations of carbon dioxid where any downward movement is visible is due to mechanical stress and not to a reversal of geotropism. In the higher concentrations of carbon dioxid the geotropic response usually occurs first, followed by the heliotropic response if the latter takes place at all. With an increase in the concentration of carbon dioxid there is a general tendency for the stomata to close."

The colour of citrus fruit, H. C. Henricksen (*Jour. Gold Coast Agr. and Com. Soc., 2 (1923), No. 2, pp. 127–129*).—The method used at present for coloring citrus fruit is to expose it for some time to the gases produced by the combustion of gasoline or kerosene without raising the temperature above 76 to 86° F. This has not so far proved very satisfactory because of an insufficient knowledge of the process, leading to four chief difficulties: The rind of the fruit is frequently spotted by the action of the gas; the stems loosen on a large percentage of the fruit, resulting in Diplodia decay; the color produced is seldom uniform in any lot of fruit; and the results, when satisfactory, can not be reproduced with certainty. These difficulties are discussed, as are the effects of the other gases, along with practical considerations.

The useful plants of Nigeria, J. H. Holland (*Roy. Bot. Gard. Kew., Bul. Misc. Inform., Add. Ser. 9, pt. 1 (1908), pp. 176, pls. 5; pt. 2 (1911), pp. VII+177–342; pt. 3 (1915), pp. 343–536; pt. 4 (1922), pp. 537–963+VI*).—The first 46 pages of this contribution are devoted to a brief general account of the area, with name list of collectors who have contributed plant specimens from Nigeria from the early part of the nineteenth century. The remaining pages deal in systematic and descriptive form with plants of this region. The index gives English, vernacular, and botanical names.

GENETICS.

Early embryonic differentiation, J. S. Huxley (*Nature [London], 113 (1924), No. 2834, pp. 276–278*).—The works of several investigators dealing with the factors influencing early embryonic differentiation are reviewed, from which it is concluded that "the germ can not be held to become 'the embryo in the rough' until chemo-differentiation has started. After this moment, organ-forming substances are all important, but in most unfertilized eggs scarcely exist. The production of these organ-forming substances depends upon the varying interaction of differentiator and genes in regions of various activity. The differential which determines the variation of activity is the system of metabolic gradients, which, although definitely organized, is very far from constituting the egg an embryo, however much in the rough. One of the two main gradients is determined at or after fertilization by agencies external to the ovum. The other is determined in the unfertilized egg, but from analogy with other forms it is to be expected that this too will be found to have been earlier determined by agencies external to the oocyte (position of the oocyte in the germinal epithelium, blood supply, etc.).

" There is thus no reason for calling in question the efficacy of the chromosomes (Mendelian factors) as regulators of development, whether individual, specific, or phyletic. In the absence of evidence to the contray, and in consonance with all our positive knowledge, it is simplest to assume that they provide both the necessary complexity and the necessary specificity for development, while the two main gradients provide the difference between parts of the germ necessary for the start of localized qualitative differentiation and the activity of the dorsal lip the energy needed to set the process in action."

Polyploidy, R. R. GATES (*Brit. Jour. Expt. Biol., 1 (1924), No. 2, pp. 153–182*).—This is a rather extensive review of the occurrence of polyploidy in plants and the lower animals, with special reference to its operation in the origin of mutations and to evolution. The chromosome numbers of many species of plants of certain genera are shown to be doubles, trebles, etc., of the chromosome numbers of other species in the same genus.

Cytological studies in the genus Rubus, A. E. LONGLEY (*Amer. Jour. Bot., 11 (1924), No. 4, pp. 249–282, pls. 5, figs. 13*).—A study at Harvard University of the chromosome number and behavior in the pollen mother cells of various species and forms of Rubus, mostly of New England origin, indicated that *Rubus* spp. may be divided into two major classes as follows: (1) Diploid, in which the gametophytic chromosome number is 7 and the sporophytic 14, and (2) polyploid, including triploid, tetraploid, pentaploid, hexaploid, and octoploid. Many of the New England Rubi were found to be in the triploid group. The first class is characterized by a regular distribution of chromosomes and pollen formation and the second class by a striking irregularity in chromosome distribution and irregular pollen formation, leading frequently to polycary and polyspory. The diploid condition is believed by the author to be indicative of a pure species and the polyploid of hybrid origin. The genus Rubus apparently contains a large proportion of hybrid forms, which have arisen by natural hybridization. *R. neglectus*, contained in the diploid group and known to be a hybrid form, is undoubtedly an exception to the general rule, leading to the statement that degeneration of the pollen grain is not always associated with irregular mitosis, etc. The paper is abundantly illustrated.

A genetic and cytological analysis of a section deficiency involving four units of the X-chromosome in Drosophila melanogaster, O. L. MOHR (*Ztschr. Induktive Abstam. u. Vererbungslehre, 32 (1923), No. 2–3, pp. 108–232, pl. 1, figs. 8*).—A mutation in *D. melanogaster* called Notch 8 is described, with the results of genetic and cytological tests on flies showing this character at the Christiania University. The cause of the mutation was attributed to a loss of that section of the X-chromosome from the locus 1.5 to 5.3. Flies having the deficiency in both chromosomes, as well as males with the deficiency, die. No crossing-over occurs in this region, but normal crossing-over occurs in the rest of the chromosome. Cytological examinations showed no fragments of chromosomes, though the same end of the two X-chromosomes may have been slightly different. No difference in length was observed, however. Gynandromorphs and mutations occurring during the investigation are also briefly described.

Studies in mammalian spermatogenesis.—IV, The sex chromosomes of monkeys, T. S. Painter (*Jour. Expt. Zool., 39 (1924), No. 3, pp. 433–451, pls. 5, fig. 1*).—More detailed descriptions of spermatogenesis in the *Rhesus macacus* monkey and the Brown Cebus monkey are given than were previously noted (E. S. R., 48, p. 471; 50, p. 825). Several drawings of the chromosome formations are also included.

The heredity of pattern color and other characters in pigeons [trans. title], W. Christie and C. Wreidt (*Ztschr. Induktive Abstam. u. Vererbungslehre, 32 (1923), No. 2–3, pp. 233–298, pls. 5, figs. 2*).—The results are reported of three years' experiments dealing with the hereditary behavior of colors, markings, and other characters in pigeon crosses, mainly between the Norwegian Petenten and the Yellow Danish Tumbler. The Norwegian Petenten is a white pigeon with a dark red shield (wings except flight feathers), having a ruffling of the feathers around the back of the head (capped) and a ruffling of the feathers on the breast, a short beak (about 18 mm.), and brown iris color. The Danish Tumbler is self yellow in color, the feathering on the back of the head and breast are smooth, the average beak length is 22 mm., and the iris is white.

The Yellow Danish Elster was used in crosses with both of the above varieties to study the inheritance of Elster markings, which are white wings and abdomen, with the other parts of the body colored. The usual procedure in the experiments was to mate part of the F_1s to produce F_2s, and the rest were back crossed with the recessive parent.

In regard to the heredity of pattern, which was not satisfactorily worked out in all details, the authors concluded that there were carried by the Petenten a recessive factor *p* causing a white head, neck, abdomen, and breast, linked with a recessive factor s_1 causing a white tail. Another independent recessive factor *k* was also responsible for a white head. The experiments conducted showed 28.8 per cent crossing-over between *p* and s_1. The Danish Tumbler carried a recessive factor s_2 which also causes a white tail. The factors for color, which have been mainly worked out by other investigators and which are reviewed here, were A for dominant red, *r* for recessive red, *d* for dilution, *w* a basal factor for color, *g* for intensity of color, S a distribution factor for color, C producing a hammered wing shield, and S*t* a factor for speckling. Factors A*d* and S*t* are sex linked. The crossover percentages obtained between A and *d* by back crossing F_1s to Yellow Danish Tumblers were 20 per cent and in the F_2s 30.2 per cent, as compared with 39.7 per cent reported by Cole and Kelley (E. S. R., 42, p. 764).

Further study of the factor *g* for intensity of color indicated that in crosses where equal numbers of intense and nonintense offspring should theoretically occur, there were significantly greater numbers of intense young produced during the first half of the breeding season of each year, with correspondingly less during the second half of 1920 and 1922, and practical equality in 1921. An hypothesis, based on the condition of the parents, was advanced in explanation.

The feathering conditions causing the cap and the ruffling of the neck of the Norwegian Pententen were found to be recessive to the normal condition, the former agreeing very well with a single factor explanation, while the latter was midway between the expectation on one and two factor hypotheses. The factor for the capped condition was designated as *ru*, while the single factor *kr* was assumed to be responsible for the neck ruffling. Beak length was found to be inherited as a quantitative character. In the F_1 the medium beak length of the Danish Tumbler was incomplelety dominant to the short beak of the Pententen. The small numbers involved did not allow for a proper analysis of iris color.

Heritable characters of maize.—XVII, Intensified red and purple aleurone color, A. C. FRASER (*Jour. Heredity, 15 (1924), No. 3, pp. 119–123, fig. 1*).—Evidence that certain blackish colors of the aleurone layer in corn (E. S. R., 50, p. 528) are produced by the combined action of a recessive factor, *in*, and the fundamental aleurone series *A C R i*, together with either *Pr* or *pr*, is reported from Cornell University. The normal allelomorph (*In*) of this factor results in light shades of color. Two kinds of these blacks are recognized genetically, one a modification of light red and the other of light purple. They differ in the *Pr pr* factors and apparently the intensity of their color is due to the same gene, *in*.

Some studies in the production of double blooms of stocks (Mathiola icana annua), T. H. WHITE (*Maryland Sta. Bul. 259 (1923), pp. 87–102, figs. 3*).—Studies of various factors that might be concerned in controlling the proportion of double and single flowers in the stock indicated that the character for doubleness is a hereditary one and in no manner concerned with environmental conditions such as soil, age of seed, location of the seed pod on the stalk, etc.

It was found that planting in impoverished soil or the starving of potted plants did not increase the number of double blooms. No relation was observed between the position of the seed pod on the plant and the proportion of doubleness in the resulting flowers. A positive correlation was found between size of the seedlings and the character of doubleness, the larger seedlings usually containing a greater number of double flowered individuals than did the smaller seedlings. However, it is not deemed possible to select in this manner plants all of which possess the double flowering character. The planting in 1921 of seeds saved in 1916 failed to result in any increase in the proportion of doubles, in fact the number of double flowered plants was not quite equal to that obtained with the same seed in 1916. A study of five florists' varieties of the Colossal and seven of the Beauty type showed the former group to contain much the larger proportion of double flowering plants.

Aberrant endosperm development as a means of distinguishing linkage groups in maize, R. A. EMERSON (*Amer. Nat., 58 (1924), No. 656, pp. 272–277*).—Evidence from aberrant endosperm development (E. S. R., 47, p. 34) can probably be used to determine whether other aleurone and endosperm genes are linked or independently inherited, i. e., to determine whether their loci are in the same or in different (nonhomologous) chromosomes.

On alleged seasonal variations of the sex-ratio in man, G. BONNIER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 32 (1923), No. 2–3, pp. 97–107, fig. 1*).—Based on 2,316,321 births, as recorded by months from the official statistics on the Swedish population from 1901 to 1917, the author found that the greatest numbers of births invariably occurred in March, with the smallest numbers in November, but no such definite relation to the sex ratio was found to exist from year to year, and the coefficient of correlation between the sex ratio and numbers of births was only -0.020 ± 0.070. It is thus concluded that the seasonal variations in the sex ratios are too small for significance and probably have no relation to the breeding season. The author also takes the opportunity to criticize the work of W. Heape dealing with the sex ratios of white and colored people in Cuba, in which a relationship between the seasonal rate of births and the sex ratios was reported.

The chemotaxis of spermatozoa and its questioned occurrence in the animal kingdom, W. J. DAKIN and M. G. C. FORDHAM (*Brit. Jour. Expt. Biol., 1*

(1924), No. 2, pp. 183–200, figs. 2).—The results are reported of two series of experiments to determine whether any substance was secreted from ova of the *Echinus esculentus* to attract the spermatozoa.

In the first experiment fine silk bags containing ova were placed in dishes in which sperms were present in sea water, and the concentration of the sperms in the vicinity of the ova was determined in samples of the sea water drawn into a pipette. It was found, however, that the tendency of the sperms to adhere in columns made these results unreliable.

In the second series of experiments capillary tubes sealed at one end were filled with sea water, sea water containing crushed ovaries, sea water which had been filtered over ova, or unbroken pieces of the ovary or coelomic fluid. Other tubes contained sea water plus small amounts of HCl, KCN, or quinin bihydrochlorid, and in other tubes the H-iron concentration was varied. These capillary tubes were placed in sea water suspensions of spermatozoa, and from a study of the numbers of sperms entering the tubes it was regularly found that there were many more entering the tubes containing the egg water. From this it was concluded that the esculentus eggs give off substances which tend to direct the movement of the sperms.

In other experiments egg water from the species *Echinocardium cordatum* had no influence on the sperms of *Echinus esculentus*, and no chemotactic action was demonstrated between the egg water of *Teredo navalis* and the sperms of that species.

Absence of prenatal effects of lens-antibodies in rabbits, J. S. Huxley and A. M. Carr-Saunders (*Brit. Jour. Expt. Biol., 1 (1924), No. 2, pp. 215–248*).—The results of experiments designed to repeat those of Guyer and Smith (E. S. R., 44, p. 566) are reported. The main differences in the experiments were that these were carried on with agouti and Dutch pattern rabbits and that the lens material was mainly intravenously injected into the fowls for the development of the antibodies, whereas albino rabbits were used in the prior experiments and the fowl injections were made intraperitoneally.

The authors immunized 30 fowls to either rabbit or ox lens, and only serum from fowls giving a positive test for antibodies was used. The does were given varying doses of the serum from the eighth to the tenth day of pregnancy, followed by succeeding doses up to the twentieth day of pregnancy. Fourteen does received antirabbit lens serum, 5 antiox lens, and 10 both antirabbit lens and antiox lens serums. Fifty-seven young were obtained and their eyes examined both with and without the ophthalmoscope. The lenses were also dissected and compared.

Twelve of the does produced no young. The eyes of the young born were all normal with two exceptions. In one there was an abnormal condition of the left side of the skull so that the eye was sunken in and covered by a flap of skin, the bones of the skull being twisted out of shape. The eyes of this individual, however, upon dissection were found to be normal. The lens of another rabbit dissected out some hours after death was found to exhibit a pyriform opacity with the broader end of the opaque area toward the center of the lens. The eyes of normal young were found to show a post-mortem opacity, but the usual character was not identical with that found in this case.

The authors, however, concluded that "the results of treating the does with sensitized serum are therefore negative." Some of the young from treated parents are now being mated inter se for further results.

For a study of the development of active immunity, rabbit lens was injected into 3 does and ox lens into 9 does. Six of these does died within a few minutes from shock. The remaining were immediately mated, after which one or more injections were given. No abnormalities in the eyes of the treated does or in the 17 young born in 3 litters were observed. Serological tests indicated that the does produced lens antibodies, but in rather small amounts. After making a comparison of the results with those of Guyer and Smith, in which it is noted that the probabilities of modifying the eyes were equally good in these experiments, the authors state "that until (a) coincidence is excluded by a statistically significant number of successes and (b) something more is discovered as to the modus operandi of the antibody and in particular of the conditions of the failure or success of its action, it is not only unprofitable but illegitimate to attempt to generalize from the data and to apply broadcast the principles involved to evolutionary problems."

The effect of different species' lens antisera on pregnant mice and rats and their progeny, G. F. FINLAY (*Brit. Jour. Expt. Biol., 1 (1924), No. 2, pp. 201–213*).—The injection of pregnant mice at the School of Agriculture, Cambridge University, with antigen to rat, ox, and sheep lens produced by rabbits and fowls resulted in a considerable reduction in the size of litters, but no abnormal conditions of the eyes of the young resulted in either the offspring or the F_2s produced by brother and sister matings. The antirat lens serum seemed to be most toxic to the mice. Normal young were also born to female rats injected for several weeks prior to pregnancy with rat lens which was designed to create active immunity. The authors suggest that it is difficult to raise defective mice and, therefore, that some of the mice which died may have been troubled with defective vision. As an opacity of the eye develops immediately after death, it was impossible to examine the dead individuals.

FIELD CROPS.

Present day agriculture, E. BASSI (*Agricoltura d'Oggi. Piacenza: Carlo Tarantola, 1924, pp. XIX+583, figs. 4*).—This volume describes the characteristics, environmental needs, varieties, cultural methods, and field practices involved in production, and diseases and insect pests of the principal cereals, forage plants, and textile, oil, and root crops customarily grown in Italy.

Grassland farming: Pastures and leys, W. J. MALDEN (*London: Ernest Benn, Ltd., 1924, pp. XXIV+314, figs. 113*).—Designed for the British farmer, this volume treats of the establishment and management of temporary and permanent pastures and meadows, discussing in some detail pasture plants, seeding and mixtures, renovation, fertilizing, irrigation, making hay and silage, grazing, harvesting seed of pasture plants, and breaking up pastures. Descriptions and illustrations of pasture and meadow plants and of their seeds and the seeds of weeds common among pasture seeds are appended.

The textile fibers, J. M. MATTHEWS (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1924, 4. ed., rewritten and enl., pp. XVIII+1053, figs. 411*).—This is a revision and enlargement of a work noted earlier (E. S. R., 32, p. 308).

[Report of field crops work in Tennessee, 1916–1922], S. M. BAIN, O. M. WATSON, S. H. ESSARY, and C. A. MOOERS (*Tennessee Sta. Rpts. 1916, pp. 11, 16; 1917, p. 9; 1918, pp. 8, 9, 10; 1919, pp. 5, 10; 1920, p. 16; 1921, pp. 7, 8; 1922, pp. 7, 9, 10, 11*).—These pages give brief accounts of variety trials with corn, cotton (E. S. R., 50, p. 31), soy beans, sweet potatoes, and miscellaneous forage crops; source of seed tests with potatoes and cotton; and planting tests with corn (E. S. R., 42, p. 632) and sweet potatoes. The merits of Neal Paymaster corn (E. S. R., 47, p. 632) are pointed out.

Breeding work and variety and strain tests with lespedeza (E. S. R., 45, p. 131) are detailed. Liming was decidedly beneficial to the growth of the crop. The difficulty of handling flowers so small and delicate as those of *Lespedeza striata* and the botanical differences between the annual and perennial species are held to make successful hybridizing doubtful. Seed buried at different depths in the soil and under different moisture conditions were either decayed when taken up 18 months later or, if still firm, failed to germinate in the incubator.

Corn planted on land that had grown for two years corn, lespedeza, sweet clover, and sweet clover and orchard grass averaged 48.2, 61.4, 79.9, and 59.6 bu. per acre, respectively. Differences in favor of the legume plants were apparent during the growing season.

The North American species of Aristida, A. S. Hitchcock (*U. S. Natl. Mus., Contrib. U. S. Natl. Herbarium, 22 (1924), pt. 7, pp. 517–586+VIII*).—A revision of Aristida, one of the larger genera of North American grasses, is presented. There are 60 species pertaining to Aristida in North America, 7 of which are here described as new.

Washington barleys, E. G. Schafer, E. F. Gaines, and O. E. Barbee (*Washington Col. Sta. Bul. 181 (1924), pp. 4–25, figs. 6*).—Descriptions and comparative yields are given for 23 varieties of barley tested during the years 1913–1923. The relative acreages and acre values of barley, wheat, and oats have been noted in a previous bulletin (E. S. R., 51, p. 37).

The greater portion of the barley crop of Washington is grown in the southeastern part of the State. Bearded 6-rowed spring barleys, exemplified by Beldi Giant, have excelled in tests at the station. The yields of Winter Club, the leading variety for fall seeding, have averaged 11.3 bu. per acre less than Beldi Giant during 10 years. White Smyrna, the best of the 2-rowed varieties, is not recommended because it yields 8.3 bu. less than Beldi Giant and has very weak straw. The naked varieties are low in yield and have weak straw and are not generally grown. Horsford, the foremost of the beardless barleys, produces more grain per acre than any of the 2-rowed varieties. It yields less than Beldi Giant, but its stiffer straw and the absence of beards render it more desirable for hay.

The 1923 cotton survey of the Salt River Valley, R. S. Hawkins, S. P. Clark, I. A. Briggs, and B. J. Showers (*Arizona Sta., Timely Hints for Farmers, No. 145 (1924), pp. 13, fig. 1*).—Of about 98,000 acres of cotton in Maricopa County, Ariz., in 1923, 40,000 were in Pima and 58,000 in upland varieties. An increase of from 35 to 45 per cent in the cotton acreage is indicated for the Salt River Valley in 1924, with 72 per cent of the 1924 acreage being planted to Acala, 13 to Hartsville, 9 to Pima, and about 5 per cent to Mebane, with a very small acreage in Durango and other varieties. Tabulations show the comparative yields and time of maturity, effect of rates of planting on stands, and number of cultivations and irrigations for the above varieties when planted on six soil types of the region and their acre yields as affected by date of planting.

Cotton growing in Australia, W. H. Johnson (*Bul. Imp. Inst. [London], 21 (1923), No. 4, pp. 596–607*).—The factors affecting cotton production in Australia are described, with notes on the characteristics of prospective cotton growing areas. The soil and climatic conditions in large portions of Queensland, northern New South Wales, northwest Australia, the irrigation settlements, and probably also in the Northern Territory are considered well adapted for cotton cultivation, but properly conducted experiments are needed to decide if the crop can be profitably grown on a commercial scale and to determine the best planting season and varieties for particular districts.

Studies in Gujarat cottons, Part II, M. L. Patel (*India Dept. Agr. Mem., Bot. Ser., 12 (1924), No. 5, pp. [4]+185-262, pls. 3, figs. 13*).—The present memoir deals essentially with the second of the important varieties of *Gossypium herbaceum* of Gujarat, namely, that known as Broach deshi, or lalio, together with a critical consideration of the environment, chiefly climatic, of the cotton plant in Gujarat, and also with a number of other observations on the general botanical characteristics of *G. herbaceum* cottons. The inheritance of certain characters in Broach deshi cotton, including length of internodes on the main stem and monopodia, length of petioles of leaves on the main stem, number of monopodia, position of the first fruiting branch (sympodium) formed on the main stem, shedding of flower buds, flowers, and young bolls, early or late flowering, size and shape of the bolls, length of staple, seed weight, and lint index, is described, as well as the correlations between length of petioles and greatest breadth of leaf, weight of seed and size of boll, weight of seed and weight of lint on the seed, and weight of seed and length of staple in heavy seeded strains. A previous memoir (E. S. R., 47, p. 335) was concerned with Goghari cotton.

The physical causes of the lustre in cotton, A. Adderley (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 3 (1924), No. 9, pp. 105-116, figs. 10*).—A method of measuring the luster of lint cotton is described, and the results of measurements on 16 samples of raw cotton from various sources and on 3 samples of mercerized cotton obtained by pulling down mercerized doubled yarns are tabulated.

The values of luster so determined were not found to be correlated with the length, hair weight per centimeter, diameter, or convolutions of the cotton, but were closely connected with the shape of the cross sections of the hairs. Cotton fibers which tend to be circular in section have a higher luster than fibers whose sections are flattened. This interpretation of the cause of luster appears applicable to raw cottons and to cottons mercerized under and without tension. The possibility of obtaining an increased luster on mercerized cotton is shown to depend upon improvements in the mercerization process or in the choice of cottons for mercerization.

Delinting and recleaning cottonseed for planting purposes, J. E. Barr (*U. S. Dept. Agr. Bul. 1219 (1924), pp. 20, pls. 8, figs. 8*).—Investigations were made to determine the effect of delinting at varying rates of cut on the percentage of the seeds injured by the delinter saws, the appearance of the seeds, germination, planting capacity, and weight per bushel or volume of 30 lbs. in terms of a bushel. Attention was also given the factors involved in recleaning cotton seed. The cost of delinting and recleaning is shown, and the agricultural possibilities of delinted and recleaned cotton seed are pointed out.

Cotton seed may be delinted very closely with not over 1 per cent saw-cut injury, and from 100 to 150 lbs. of linters per ton of seed may be removed with safety. When delinted at the high rate very little linters or fuzz is left on the seeds.

Delinting greatly accelerates germination, reduces the weight of the individual seeds, increases the planting capacity, reduces the volume of cotton seed per unit of weight, and increases the weight per measured bushel. Although delinting does not reclean cotton seed, it is held a necessary prerequisite for recleaning and grading cotton seed efficiently and economically. Average recleaned ginned seeds show little or no reduction in the percentage of lightweight seeds contained and slight improvement as to the inert matter removed, whereas recleaned delinted seeds are practically free of lightweight seeds and inert matter. The loss of good seeds in recleaning ginned seed is unnecessarily heavy, while such loss in recleaning delinted seeds may be negligible. The total dockage or shrinkage in delinting and recleaning cotton seed varies with the condition of the seed as it comes from the gin.

The British Columbia potato, C. Tice (*Brit. Columbia Dept. Agr. Bul. 86, rev. ed. (1924), pp. 84, figs. 79*).—This is a revision of a bulletin noted earlier (E. S. R., 46, p. 231).

Proceedings of the tenth annual meeting of The Potato Association of America (*Potato Assoc. Amer. Proc., 10 (1923), pp. 212, pls. 2, fig. 1*).—A report of the tenth annual meeting of the association (E. S. R., 50, p. 398), held at Cincinnati in December, 1923, reviewing the activities of the organization and of its committees in 1923.

Further studies in field plot technic in potato yield tests, F. A. Krantz (*Potato Assoc. Amer. Proc., 10 (1923), pp. 174–179*).—Results of two years' tests (E. S. R., 49, p. 832) under University Farm conditions at the Minnesota Experiment Station gave evidence that replication is a much more effective means of reducing experimental error than an increase in plat size. While longer rows give somewhat lower probable errors than shorter ones, the use of rows of greater length than 2 rods does not appear to be justified. Replication proved to be an effective means of reducing the size of the probable error, and the agreement between the result obtained for as many as 16 replications agreed well with the mathematical expectation.

Ecological factors affecting tuber-set in potatoes, E. V. Hardenburg (*Potato Assoc. Amer. Proc., 10 (1923), pp. 165–172*).—The influence of certain environmental factors on the setting of tubers on potatoes was studied at Cornell University.

Temperature is apparetly influential in determining stolon development, since plants grown at 68.6° F. produced an average of four more main stolons per plant, a greater weight of stolon per plant, and nearly four times the number of stolon branches per stolon as did those grown at 59.6°. Soil moisture between 17.7 and 23.2 per cent exercised a less marked influence than air temperature on tuber set. The influence of soil temperature was considered negligible. The results agree with those obtained by Clark (E. S. R., 45, p. 634), in that the number of tubers per hill was highest in the lighter soil in two localities. Also the weight per hill and per tuber were most favorable in the lighter soils. The tuber set per hill in potatoes planted May 31 was about the same for August 25, September 15, and October 6 harvests. With May 31, June 20, and July 10 plantings harvested October 6, the later plantings set fewer tubers and made lower yields.

The effect of temperature on the potato plant, J. Bushnell (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 307–310*).—Humidity had no effect on the growth of the potato plants, whereas temperature had a striking influence, in a study under approximately controlled greenhouse conditions at the Minnesota Experiment Station. The maximum temperature at which Early Ohio potatoes produced tubers was between 20 and 23° C. (68 to 73.4° F.). The failure to produce tubers at 23° and above is attributed to an increased rate of respiration, consuming the carbohydrates that at lower temperatures are stored in the tubers.

Potato storage investigations during 1922–23, L. M. Marble (*Potato Assoc. Amer. Proc., 10 (1923), pp. 179–184*).—An observational study to determine the effect of ventilation on potatoes stored under different conditions and the relationship between the humidity of the potatoes stored in bins and that of the air in the open storeroom was carried on by E. F. Hopkins at the Marble Laboratory, Inc. The conclusions reached may be summarized as follows:

For long term holding, potatoes should be stored in crates or bags in a ventilated room. Bin storage is not to be recommended on account of the danger of breakdown from rots and molds. Ventilation in the storage room will not prevent rot and mold appearing in unventilated bins and can not be depended upon to prevent the appearance of mold and rot in ventilated bins. Crates and bags should preferably be stored on a slatted false floor, with provision for free movement of the air underneath the false floor. The amount of ventilation required is that which will keep the potatoes dry. So long as the potatoes are dry, rots and molds do not appear. The variations of humidity in a storage room occuring when no effort is made to control humidity are not harmful to potatoes stored in bags and crates, and do not affect potatoes stored in bins.

Some factors in storage, A. T. Evans and A. La Bushey (*Potato Assoc. Amer. Proc., 10 (1923), pp. 184–187*).—The cause of changes accounting for the difference in keeping quality as well as palatability between early and late varieties of potatoes was studied at the South Dakota Experiment Station. Tables show the contents of moisture, sugar, and ash, loss of weight, and transpiration of water and carbon dioxid in the Early Ohio, Irish Cobbler, Carman No. 3, and Rural varieties. Moisture was found to be the prime factor in decay, with temperature secondary. If moisture was removed as fast as formed no rots occurred. When a car of potatoes was shipped from Watertown, S. Dak., to Chicago, the moisture was reduced about 15 per cent in the end supplied with stone lime.

The pollination of rice [trans. title], F. F. R. Heide (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Alg. Proefsta. Landb., No. 15 (1923), pp. 49, pls. 2, fig. 1*).—Varieties of rice exhibit open, closed, and variable pollination subject to climatic factors. Studies reported in this publication indicate that the large majority of the rice varieties of the Netherlands Indies probably belong to the latter group, generally showing autofecundation in dry, sunny weather and cross-pollination with cloudy, moist weather. With open pollination, fertilization in the periphery of the panicle is more complete than in the interior, whereas with closed pollination this difference is much less marked. In the lower third of the panicle of almost all varieties fertilization is said to be below the average for the whole panicle, the lower part showing more empty glumes and more dropping. An average of about one-fourth of the panicle does not set, not considering the loss caused by attacks of parasites. Observations made in the Padang Uplands (Sumatra) and in Java show that the causes of the failure of flowers to set must largely comprise external conditions of nutrition and not insufficient fertilization.

Experiments with sugar beets in Tucumán, W. E. Cross (*La. Planter, 72 (1924), Nos. 10, pp. 192, 193; 11, pp. 212–214*).—Investigations with sugar beets in Tucumán since 1917, including varietal, fertilizer, cultivation, and storage tests and analyses, are described, with comment on the possibilities of the crop in the region.

Leaving the beets in the field for about 10 days after removal from the soil resulted in a slight increase in sugar content. Stable manure tended to give an increased yield of beets, which were of lower sucrose content, a result analogous to that obtained in experiments with similar fertilizers on sugar cane. Lime seemed to increase the yield of beets without affecting their sugar content. The larger beets were generally poorer in sugar than the smaller ones. The effect of storage was to produce a certain loss in weight of the beets, due to evaporation, with a more or less proportional increase in sugar content.

Lodging of sugar cane [trans. title], J. M. Geerts (*Arch. Suikerindus. Nederland. Indië, 31 (1923), No. 22, pp. 513–522*).—The causes of lodging of sugar cane are explained and preventive measures are discussed, reference being made to the work of Douglas and of Houtman (E. S. R., 37, pp. 443, 444).

Basal, middle, and top portions of standing stalks of DI 52 cane grown in Goedo were found to contain 17.81, 18.55, and 15.4 per cent of sugar, respectively, whereas corresponding parts of fallen cane had 14.02, 15.89, and 12.26 per cent. The average purity of standing cane was 91.15 per cent and the sugar content 17.31, and that of the lodged stalks 85.87 and 14.1 per cent, respectively. Some varieties, viz, 100 POJ, are said to be more predisposed to lodging than others, while EK 2 and DI 52 exhibit this tendency in a much smaller degree.

Influence of fertilizers on the yield and form of the sweet potato, L. G. Schermerhorn (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 162–165*).—Results obtained at the New Jersey Experiment Stations showed organic sources of nitrogen to be superior to minerals for sweet potatoes, tankage having the greatest influence on yields of marketable stock. An increase in yield followed increase of potash up to 8 per cent and a decline with 10 per cent or more. A comparison of analyses on high, medium, and low yielding plats shows that as the nitrogen increased and the potash decreased the yield of marketable tubers fell, whereas with the potash increased to 8 per cent and the nitrogen reduced to 2 or 3 per cent a decided increase in yield resulted. Phosphoric acid seemed to play a small part in the production of sweet potatoes.

The influence of potash on form is indicated by proportions showing the relation of length to diameter. Average measurements on sweet potatoes from plats receiving in addition to 3 per cent nitrogen and 8 per cent phosphoric acid, 0, 4, 6, and 8 per cent potash, gave respective proportions of 6.9 : 1.66, 5.6 : 2.06, 5.39 : 2.24, and 5.47 : 2.19. The effect of application of nitrogen was shown by the following proportions: 2 per cent nitrogen, 5.83 : 2.09; 4, 6 : 2.05; 6, 6.11 : 2.14; 8, 5.64 : 1.87; 10, 6.06 : 1.92; and 12 per cent nitrogen, 6.8 : 1.93.

Effect of certain sodium and potassium salts on sweet potato production in eastern Virginia, T. C. Johnson, H. H. Zimmerley, and F. W. Geise (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 155–162*).—In experiments carried on by the Virginia Truck Experiment Station, sodium chlorid applied at rates of from 500 to 2,000 lbs. per acre as a top-dressing resulted in distinct increases in the yield of sweet potatoes, with 1,000 lbs. appearing to be the optimum application. No relation was apparent between resultant yields of sweet potatoes from plats top-dressed with either sodum chlorid, potassium chlorid, sodium sulphate, or potassium sulphate, and the individual elements or combination of elements composing the salts. Since all the salts used as top-dressers gave decided increases in yield over the untreated plats they seemed to exercise some common influence, as manifested by an apparent increase in the rate of carbohydrate metabolism.

The blooming of wheat flowers, C. E. Leighty and W. J. Sando (*Jour. Agr. Research [U. S.], 27 (1924), No. 5, pp. 231–244, figs. 2*).—Observations on wheat flowers, reported in this contribution from the Bureau of Plant Industry, U. S. D. A., were made primarily to obtain additional information (E. S. R., 41, p. 440) on the effect of external factors on blooming.

Heads on wheat plants of the Fultz type growing in the open at Washington, D. C., were under practically continuous observation throughout their blooming periods and nearly all of their flowers were observed to bloom. The time required for a wheat flower to open fully and the anthers to assume a pendent position varied considerably but averaged 3.6 minutes for 25 flowers, while the time from beginning of opening to complete closing averaged 26.5 minutes.

Of all flowers under observation, 86.2 per cent bloomed during daylight, 6.9 during twilight, and 6.9 per cent during the night.

In most of the heads blooming began in the lower half of the uppermost third of the head, the lowest flower in the spikelet usually blooming first and the others following in order from lowest to highest, usually on successive days, although two flowers in the same spikelet sometimes bloomed on the same day. Some of the upper flowers in certain spikelets bloomed before the lowest or lower flowers in other spikelets, depending on their position in the head.

Blooming on different heads extended over periods from about 101 to about 123 hours, a maximum of 25 flowers on one head blooming in a day. Periods of intense and reduced blooming alternated throughout the day, the time of their occurrence depending to a considerable extent on temperature, rainfall, and sunshine. Blooming was observed at temperatures ranging from 56 to 78° F., inclusive.

The percentage of seeds set in the spikelet decreased from the lowest to the highest position, little difference existing, however, between the first and second positions.

In additional experiments at Arlington, Va., flowers submerged in water were observed to open without dehiscence of the anthers. Full and apparently normal blooming occurred in continuous darkness. Temperatures of 55° and below checked blooming in certain flowers, although pollen was discharged from anthers of flowers, previously opened, when the temperature was reduced as low as 52°.

Inspection of agricultural seeds, E. G. PROULX ET AL. (*Indiana Sta. Bul. 276 (1924), pp. 72, figs. 5*).—The purity, germination percentage, and hard seed and weed seed content are tabulated for about 900 official samples of agricultural seed obtained from seed merchants in 1923.

HORTICULTURE.

Seventy-five years of American horticulture, J. H. GOURLEY (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 257–268*).—In this, the presidential address delivered before the American Society for Horticultural Science at Cincinnati, in December, 1923, the author reviews the progress of American horticulture during the preceding 75 years, pointing out the various important events which have led up to the present period of constructive research. The period of 75 years is divided into three distinct eras, as follows: (1) amateur from 1848 to 1880, (2) variety testing from 1880 to 1900, and (3) research from 1900 onward.

Description of some commercial varieties of cabbage (Brassica oleracea capitata) [trans. title], F. KOTOWSKI (*Rocz. Nauk Rolnicz., 10 (1923), No. 3, pp. 545–569, fig. 1*).—In a biometrical study of several varieties of cabbage carried on as a preliminary step to breeding operations, it was found that certain varieties are much more uniform than others.

Changes in quality and chemical composition of parsnips under various storage conditions, V. R. BOSWELL (*Maryland Sta. Bul. 258 (1923), pp. 61–86, figs. 8*).—Studies of a quantity of parsnips, part allowed to remain in the field, part held in artificial storage at 20 and 34° F., and part stored in an ordinary cellar, indicated that roots may be rapidly brought to a state of high table quality by placement in cold storage at from 32 to 34°. At 34° openly exposed roots attained in 16 days a sucrose content and eating quality similar to that obtained by field roots in slightly over two months. The hydrolysis of starch and other polysaccharids and the consequent accumulation of sucrose proceeded much more rapidly in the 34° chamber than in the field or in the cellar. In roots stored at 20° solid freezing occurred, chemical changes progressed very slowly, and decay set in shortly after removal from the storage, necessitating the almost immediate use of the roots.

The packing of parsnips in moist pine sawdust hastened sucrose accumulation in cellar stored roots and conserved moisture, but, as in the 34° chamber, this treatment imparted a bad flavor to the product. In the 34° chamber the sawdust apparently inhibited a maximum accumulation of sucrose.

In general conclusion, the author points out that the marketing period and the commercial value of the parsnip crop may be increased by early fall harvesting and placement in storage at temperatures of from 32 to 34° for a period of three weeks. The improvement in eating quality of the parsnips subsequent to exposure to low temperatures is due for the most part to the accumulation of sucrose.

The fruiting habit of the squash, W. T. Tapley (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 312–319*).—Records taken at the Minnesota Experiment Station upon the date of appearance of pistillate blossoms in several squash varieties and upon the weight and dimensions of squash developing from such blooms indicated a direct correlation between the weight of the squash and the number of days from the planting of seed to the opening of the blooms. For Kitchenette Hubbard the coefficient of correlation was 0.917±0.009, for Hubbard strain No. 23 0.726±0.02, for Delicious 0.539±0.022, and for Quality 0.310±0.026. In varieties producing large fruits, from 15 to 30 lbs., the decrease in weight of the resulting squashes amounted to 1 lb. per day for delay in fertilization of the flowers. The percentage of pistillate blooms that developed into mature fruits varied from 5.5 per cent in the Banana variety to 43.7 per cent in the Kitchenette Hubbard . Yield was found to depend, among other factors, upon the production and fertilization of a large number of early blossoms.

Insecticides and fungicides, 1923, J. M. Bartlett (*Maine Sta. Off. Insp. 110 (1923), pp. 53–60*).—In a like manner to that of the preceding year (E. S. R., 49, p. 233), the results of analyses of insecticides and fungicides received from the State commissioner of agriculture in 1923 are presented. Brief notes are given on various fungicidal and insecticidal materials.

Experiments in the propagation of fruit tree stocks, G. E. Yerkes (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 241–244*).—Following a brief discussion of the fruit stock situation throughout the country and the need of more uniform stocks, the author describes a method of root propagation which has been successfully utilized at the U. S. D. A. Horticultural Field Station, Bell, Md., for vegetatively reproducing selected Malus, Pyrus, and Prunus stocks.

The largest number and the best rooted plants were obtained when 1-year-old trees were utilized as material. Cuttings made at planting time were found to be as successful as those which had been cut earlier and allowed to callus in storage. In respect to size, pieces ranging $\frac{3}{16}$ to ½ in. in diameter and from 2 to 2½ in. in length were most successful. The cuttings taken from near the root collars were about as good as those of comparable size taken further out. Leaf buds formed at the primal end and roots at the distal end of cuttings, irrespective of the position in which the cutting was placed in the soil. However, an upright position, with the top just below the ground level, favored the best development. By making smaller cuttings and utilizing an unheated propagating house, the author secured in a single season a maximum of 66 plants from a 1-year-old seedling tree. Plants from root cuttings averaged larger at the end of the first growing season than did seedlings of the same species.

Contribution to the physiology of grafting [trans. title], G. RIVIÈRE and G. PICHARD (*Jour. Soc. Natl. Hort. France, 4. ser., 25 (1924), Mar., pp. 101–103*).—As a result of chemical analyses of Calville Blanc apples from trees worked directly on Paradise roots and from trees double worked on Api Rose and Paradise, the authors report that the fruit of the double worked trees was richer in sugars. In addition, it was found that the shape of the fruits was influenced by the double working.

Experiments in storing fruit [trans. title], N. ESBJERG and E. HOLTEN (*Tidsskr. Planteavl, 29 (1923), No. 3, pp. 329–394, figs. 4*).—Investigations begun in 1918 upon various factors concerned in the keeping of fruit led to the general conclusion that apples and pears will keep much longer in artificial than in natural storage provided the fruit is stored promptly after harvesting. The keeping capacity of fruit, irrespective of the character of the storage, was found to vary from year to year. Ventilation of the storage chambers improved the keeping capacities. Apples maintained their natural flavor during protracted storage better than pears, which, unless picked just at the proper stage of maturity, soon became decidedly inferior. Bonne Louise d'Avranches, Doyenné du Comicé, and General Tottleben pears were found to be particularly good keepers in respect to maintenance of flavor. Scabby fruits did not keep well, the fungus injuries affording an entrance to decay organisms. While fruits wrapped in tissue paper kept no better than unwrapped fruits, they were of finer appearance. Dry powdered peat proved an efficient preservative, fruits packed therein keeping approximately one month longer than untreated specimens. In fruit from a single tree, the larger sizes did not keep as well as the smaller. Large, over-sized fruit from young trees kept very poorly. The paper is accompanied by a brief English summary.

The set of apples as affected by some treatments given shortly before and after the flowers open, A. J. HEINICKE (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 19–25*).—The striking increases in percentage of blossoms to set following the ringing of limbs (approximately 3 in. in diameter) of sod-grown, moderately vigorous trees just previous to the opening of the flowers is explained by the author as due to the inability of nitrogen to pass upward past the ring, to the accumulation of carbohydrates above the ring, and the consequent upset in the carbohydrate-nitrogen ratio. When 10 lbs. of nitrate of soda were applied beneath one-half of the tree just after the ringing of the branches, the maximum set of fruit occurred in those limbs which were both fertilized and ringed, next on fertilized unringed limbs, and least on the control limbs. It is thought likely that nitrogen applications, by increasing vegetative development, increase the water-conducting capacity of the wood and the ability of the tissue to utilize water economically.

Rather disastrous results were obtained on certain branches where subsequent to the usual ringing the younger xylem was cut through to a depth of 0.5 to 0.75 in. As a result the set of fruit was greatly reduced, in some instances being entirely inhibited, and the limbs above the wounds were forced to struggle to maintain their foliage, thus showing the importance of an abundant water supply at the critical stage of fruit setting. Reference is made to an earlier noted paper by the author on the same general subject (E. S. R., 38, p. 745).

Strawberry breeding at the Ontario Horticultural Experiment Station, W. J. STRONG (*Sci. Agr., 4 (1924), No. 7, pp. 217–222*).—Tabulated data are presented showing strawberry crosses made at the station from 1913 to 1915, together with the number of seedlings grown from such crosses and the number of seedlings which appeared promising in 1920. 1922, and 1923 tests.

Marked differences were noted in the ability of parents to yield promising seedlings, the Early Ozark being one of the most successful varieties utilized.

Preliminary report on grape breeding in Maryland, E. C. Auchter and W. E. Whitehouse (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 114–116*).—Observations on approximately 1,200 grape seedlings raised from open and controlled pollinations indicated that artificial hybridization is the better method of procuring desirable seedlings. Diamond, Brighton, Clinton, and Winchell showed the most promise as parents. In respect to inheritance of fruit color, blue was apparently dominant over red. Unexpected results were obtained in utilizing Winchell, a white-fruited variety, as either pollen or ovule parent, the factors carrying white being strongly dominant over reds and blues except in the case of Campbell×Winchell, in which cross 75 per cent of the seedlings were blue.

Grape culture in Connecticut, W. H. Darrow (*Conn. Agr. Col. Ext. Bul. 69 (1924), pp. 16, figs. 3*).—General information is presented upon propagation, planting, culture, pruning, spraying, varities, etc.

Varieties of coconuts, F. A. Stockdale (*Trop. Agr. [Ceylon], 62 (1924), No. 4, pp. 204–209, pls. 11*).—Observations and measurements upon the fruits of 19 strains of coconuts found growing on an estate in Ceylon showed characteristic differences, especially in respect to size, shape, and the proportion of husk to edible parts.

Tea in Japan, C. R. Harler (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1924, No. 1, pp. 1–46, pls. 4*).—This is a presentation of information obtained as the result of a personal survey of the tea-producing industry of Japan.

Almond hybrids, M. J. Heppner (*Amer. Nut Jour., 20 (1924), No. 5, p. 76*).—Preliminary observations on almond seedlings developed by the University of California with a view to securing better and later blooming varieties revealed trees possessing promising qualities, such as resistance to red spider, high quality of nuts, late blossoming tendencies, and precocity in bearing.

Filberts in western Washington, H. D. Locklin (*Western Washington Sta. Bimo. Bul., 12 (1924), No. 1, pp. 18–22, fig. 1*).—General suggestions are presented concerning soils, planting, culture, pruning, varieties, pollination, propagation, harvesting, marketing, etc.

Practical flower gardening, K. M.-P. Cloud (*New York: Dodd, Mead & Co., 1924, pp. [10]+251, pls. 16*).—Popular information is presented upon the cultivation and characteristics of the more common perennial garden plants.

Cultivated irises (*Les Iris Cultivés. Actes et Comptes-Rendus de la* 1^{re} *Conférence Internationale des Iris, 1922. Paris: Soc. Natl. Hort. France, 1923, pp. 223, pls. 10, figs. 3*).—In this book, containing the proceedings of the First International Conference on the Iris, held in Paris in 1922, there are included important papers, some by American authors, upon the breeding, botany, and history of the iris.

Roses for all American climates, G. C. Thomas, jr. (*New York and London: Macmillan & Co., 1924, pp. XII+251, pls. 24, figs. 2*).—This text, illustrated in part by colored plates of flowers, presents general information on rose culture in different sections of the United States, laying particular emphasis on the selection of varieties suitable to local environments.

The American rose annual, 1924, edited by J. H. McFarland (*Harrisburg, Pa.: Amer. Rose Soc., 1924, pp. 200, pls. 22, figs. 7*).—As usual (E. S. R., 49, p. 743), this annual contains articles from various parts of the world relating to rose growing, varieties, breeding, etc.

Two papers, the first entitled Rose Hybridization for Amateurs, by M. Bilon (pp. 29–32), discussing the technique of rose breeding operations, and the second Breeding Hardy Roses for Northeastern America, by A. C. Fraser (pp. 33–36), a preliminary report upon rose breeding activities at Cornell University, are of special significance.

FORESTRY.

The scientific background of the forest policy of the United States, W. B. GREELEY (*Science, 59 (1924), No. 1534, pp. 449–452*).—In this address, delivered before the National Academy of Sciences, Washington, D. C., in April, 1924, the author reviews the present status of forestry investigations in the United States and points out the need of a comprehensive and impartial survey of the entire problem with a view to the guidance of future activities.

Idle land and costly timber, W. B. GREELEY (*U. S. Dept. Agr., Farmers' Bul. 1417 (1924), pp. II+22, figs. 9*).—This is a general review of the forestry situation in the United States, emphasizing the fact that a real timber shortage already exists in certain parts of the country due to the failure to replant cut-over lands and to the almost prohibitive costs of lumber brought in from great distances. The author suggests that the situation can best be met by public and private tree planting, by control of fires, lowering taxes on growing timber, increase of publicly owned forests, and the stimulation of education and research.

[Report of the] division of lands and forests (*N. Y. State Conserv. Comn. Ann. Rpt., 13 (1923), pp. 117–178, pl. 1, figs. 28*).—This, the usual annual report (E. S. R., 48, p. 739), presents information on alterations in area, recreational development, reforestation activities, fire prevention, and insect and disease control. Approximately nine million forest trees were distributed during the year for planting.

Annual report on the forest administration of Nigeria for the year 1922, H. N. THOMPSON (*Nigeria Forest Admin. Ann. Rpt. 1922, pp. 24*).—The usual annual statement (E. S. R., 49, p. 143).

Progress report on forest administration in the Northwest Frontier Province for the year ending 31st March, 1922, E. A. GRESWELL (*Northwest Frontier Prov. Forest Admin. Rpt., 1921–22, pp. [11]+19+XXVII*).—This report contains administrative data for the year ended March 31, 1922.

Afforestation as a means of combating floods [trans. title], C. REVERDY (In *Congrès de l'Eau, 1923. Compte Rendu des Travaux, Montpellier: Roumégous & Déhan, 1923, pp. 53–74*).—In a general discussion of the advantages of forest cover in preventing disastrous floods, the author points out that a forest soil, unlike a barren soil, does not receive all the falling rain, a part being absorbed by the leaves, branches, and trunks of the trees. On barren soils, running water carries off all particles of movable material, while in forests these particles accumulate and form a thicker and more water-retaining cover. Streams from barren mountain land carry away valuable soil and humus to the sea.

Early development of white and red pine plantations, R. C. HAWLEY (*Jour. Forestry, 22 (1924), No. 3, pp. 275–281*).—A study of sample plats of white and red pine located on the watershed of the New Haven, Conn., Water Company indicate that on the soil type (old pasture) used in the investigation, red pine is not only able to make a more rapid diameter and height growth but is also more resistant to insect and fungus pests than white pine. In addition, records of trees surviving at the end of 14 years showed 84 per cent for the red and 73 per cent for the white pine. The white pine was capable of making a greater growth in a single year, but, because of susceptibility to weevil injury, was surpassed by the red pine, which maintained a uniform rate of development. Spaced 6 by 6 ft., the trees suffered little from competition until the end of their tenth year. Birches and alders springing up in the pine plantation were removed.

A silvical comparison of the Pacific coast and Rocky Mountain forms of western yellow pine, C. F. Korstian (*Amer. Jour. Bot., 11 (1924), No. 5, pp. 318–324, fig. 1*).—A careful comparison from a silvicultural viewpoint of the Pacific coast and the Rocky Mountain forms of western yellow pine showed sufficient characteristic differences to enable the forester to distinguish two forms. The seeds of the Pacific coast, or ponderosa, form were characteristically larger and slower to germinate than those of the Rocky Mountain, or scopulorum, form. The ponderosa seedlings grew more rapidly and developed better root systems and larger aerial portions. Decided and characteristic differences in color were noted in the leaves and bark of the young seedlings, and the Rocky Mountain form showed an earlier tendency to form terminal buds. In older trees the two forms were distinguished by differences in the length of the leaves, in the size and color of the cones, and in the color of the pistillate flowers. Upon crushing, the leaves of the ponderosa form were found to yield a pleasant, resinous fragrance, in contrast to the stronger, less pleasant, terebinthin odor of the scopulorum leaves.

Age determination and adventitious roots in Norway spruce [trans. title], O. Heikinheimo (*Commun. Inst. Quaest. Forest. Finland. No. 2 (1920), pp. 30+6, figs. 11*).—Age determination was found much more difficult in Norway spruce than in Scotch pine, accurate records being obtainable only with young age classes. In older age classes the age could not be estimated within from 5 to 20 years of the actual value, and under poor environmental conditions in northern Finland estimates could not be made accurately within from 30 to 100 years. Difficulties in estimating the age of Norway spruce are said to be due to (1) the frequency of adventitious roots, (2) the height of the taproot, which causes the root crown to be moved upward from its original position, (3) the slow height growth during young age upon poor soils, and (4) the irregular formation of annular rings at the root crown.

The lopping of Norway spruce [trans. title], O. J. Lakari (*Commun. Inst. Quaest. Forest. Finland. No. 2 (1920), pp. 38+5, pls. 8*).—Observations upon normal trees and upon trees whose side limbs were lopped off during the first 20 years of their life showed that, while this treatment had no immediate effect on height growth, the ultimate development of the trees was seriously affected. Diameter growth was appreciably influenced, subsequent development being reduced by from 30 to 50 per cent. In respect to branch development, pruned trees were comparable to shaded and understory growth. The volume increment following lopping was reduced, in general, about one-half. Although the crown of the tree was able to recover subsequent to lopping, the proportion of branches to the volume of the trunk 12 to 18 years later was generally less than before the treatment. The pruning wounds afforded a ready point of entrance for various trunk-destroying fungi.

Injury to vegetation in the vicinity of zinc refineries [trans. title], E. Rosseels (*Bul. Soc. Cent. Forest. Belg., 31 (1924), No. 4, pp. 202–214*).—The erection in 1905 of zinc and lead refineries within 400 meters (1,312 feet) of a Scotch pine forest was followed in a very few months by practical cessation of growth, soon followed by a burning of the needles and the death of the entire trees. At the end of six years 80 hectares (74.1 acres) of forests had been completely destroyed.

Studies of the nature of the injury indicated that it was due to sulphur dioxid, which, entering the leaves through the stomata, was transformed into sulphurous and thence into sulphuric acid, the latter destroying the protoplasm and especially injuring the chloroplasts. The leaves and flowers were observed to be particularly sensitive. Along with the sulphur dioxid, there escaped from the refineries various compounds of lead, zinc, and arsenic, which, falling upon vegetation, aggravated the injuries. In respect to susceptibility to injury, the silver fir, Norway spruce, Scotch pine, beech, and hornbeam are classed as very susceptible; the oak, birch, and linden as susceptible; the larch, maple, ash, alder, and willow as resistant; and the poplar as very resistant.

DISEASES OF PLANTS.

Report of the botanist, S. M. BAIN (*Tennessee Sta. Rpt. 1916 pp. 10, 11*).—In briefly reviewing the work of the botanical department, the author reports experiments in which apple and pear seedlings were inoculated with pure cultures of the pear blight organism to determine resistance to the disease. Out of several thousand seedlings so tested, a few were obtained that remained free from the disease, and these were to be subjected to further investigation.

The clover anthracnose caused by *Colletotrichum trifolii* is reported much less prevalent in Tennessee than formerly. This is thought to be due either to a natural resistance in the clover grown in the State or to the wide use of a resistant strain produced at the station and reported upon previously (E. S. R., 28, p. 746).

Experiments for the production of a variety of tomatoes resistant to blight are briefly outlined.

Report of the plant pathologist, C. D. SHERBAKOFF (*Tennessee Sta. Rpt. 1922, pp. 14–19*).—Brief accounts are given of studies on wheat deterioration. Preliminary examination indicates that in Tennessee root rot of the plants is probably due to certain fungi, among which a species of Helminthosporium is considered the most important. Field and greenhouse experiments are in progress to determine whether there are any varieties of wheat adapted to local conditions that are resistant to root rot. The principal causes of wheat deterioration are said to be leaf and stem rust, scab, and root rot.

In connection with studies of Fusaria of economic plants in Tennessee, the author compared different methods of testing corn seed to determine their efficiency in ascertaining the relative freedom of the seed from fungi. In connection with this study the author found a method by which the practical freedom of corn seed from external and internal contamination of fungi could be obtained. The seed is first soaked in water at room temperature from 12 to 24 hours, after which it is placed for 10 minutes in water, the temperature of which is constantly maintained at 131° F. The seed is then removed and after a thorough cooling is dipped for 20 minutes in a 1 to 1,000 solution of corrosive sublimate. With this treatment the author was able to obtain seedlings that showed 97.5 per cent freedom from fungi as compared with less than 30 per cent when treated with corrosive sublimate alone.

A field trial was made of samples of corn tested by different methods, but the data regarding stand, root rot, and yield did not show any consistent difference, either as to the sources of the seed or the methods of treatment. It is believed, from the results of this experiment, that the seed would be considered very good.

A preliminary account is given of investigations on crown gall control in fruit tree nurseries, in which an effort was made to determine the value of effective disinfection of the grafting materials, accompanied by sanitary measures in making and storing the grafts, upon crown gall in the trees produced from the grafts. Corrosive sublimate, 1 to 1,000, for 20 minutes, was the only disinfectant used. After budding or grafting the trees were planted, and an examination showed that the Early Harvest apple trees, produced from treated grafts, had over 90 per cent of crown gall, while the trees of the variety Yates, under the same treatment, showed 50 trees healthy and only 6 with crown gall. It is believed that there was internal infection of the scion wood on Early Harvest, while on the Yates the infection was from external sources.

It is concluded that disinfection and sanitary measures are not sufficient to control crown gall on Early Harvest apple trees.

Factors influencing the pathogenicity of Helminthosporium sativum, L. Dosdall (*Minnesota Sta. Tech. Bul. 17 (1923), pp. 3–48, pls. 6, figs. 7*).—Studies are reported on the relation of temperature to the growth of *H. sativum*, to germination, infection, and development of the disease; the relation of H-ion concentration and temperature to spore germination; and the influence of soil type, moisture, and fertility on the development of the disease.

As a result of the author's studies, the widespread occurrence of *H. sativum* is explained by the fact that the fungus responds saprophytically to a wide range of environmental conditions. As a parasite, the fungus is said to cause very limited local infections, and a direct correlation was found between the amount of moisture present and the number of lesions. The severity of the infection is greater at rather high temperatures than at low ones, and it is said that the disease may be expected to develop most severely at high temperatures in the presence of sufficient moisture.

The pathogenic effect of *H. sativum* isolated from barley plants was compared with that of a Helminthosporium from stunted wheat and with *Fusarium culmorum* isolated from scabby wheat. Under the conditions of the experiment, the Helminthosporiums caused more injury than the Fusarium, and the Minnesota strain of Helminthosporium caused the greater amount of seedling injury on a variety of barley, while the Illinois strain, isolated from stunted wheat, caused the greater dwarfing of mature plants of both wheat and barley.

Wheat scab in Minnesota, J. MacInnes and R. Fogelman (*Minnesota Sta. Tech. Bul. 18 (1923), pp. 3–34, pls. 9, figs. 4*).—A study is reported of wheat scab in Minnesota, which has been known to occur in the United States for more than 20 years. The principal cause of wheat scab in this State is believed to be *Gibberella saubinetii*. Infection is said to be brought about in several ways, principally through infected seed, infested soil, débris, and corn stubble. It is said that spores from these sources might be disseminated by wind, insects, or other carriers. Overwintering experiments showed that both mycelium and spores may survive the winter in Minnesota if protected from the injurious effects of light. The temperature relations of the fungus were determined, and field observations indicate that the disease develops most rapidly at temperatures near the optimum for the growth of the fungus.

Various varieties of wheat, barley, and rye were found susceptible to attack, while oats were only slightly susceptible. Many grasses were heavily infected. By artificial inoculation and observations it was found that the organism could cause a seedling blight of flax, clover, tomato, radish, pea, and cucumber; a stem rot of squash, bean, tomato, cucumber, pea, and sunflower; and a rot of apples, carrots, and potato tubers. A root rot of bean, similar to the one found naturally on corn, was observed.

According to the authors, no entirely satisfactory control measures for wheat scab are known, but it is believed that crop rotation reduces the amount of disease. Wide differences in susceptibility to scab were also observed in varieties of wheat.

Summary of literature on bunt, or stinking smut, of wheat, H. M. Woolman and H. B. Humphrey (*U. S. Dept. Agr. Bul. 1210 (1924), pp. 44*).—A summary is given of a large number of publications relating to the cause and control of the bunt, or stinking smut, of wheat. A bibliography of 404 publications completes the bulletin.

Mercuric chloride as a preventive of certain damping-off fungi, [illegible]. Glasgow and W. O. Glover (*Science, 59 (1924), No. 1528, p. 338*).—In [illegible] course of a series of experiments for the control of the root maggot in cabbage-seed beds, there appeared to be a correlation between the treatments applied for maggots and the amount of damage done by soil-infesting fungi, such as Rhizoctonia and Plasmodiophora.

Experiments are briefly reported in which corrosive sublimate was used at the rate of 1 to 1,200, from one to six applications being given the plants. Examination of the plants showed that while one application gave but little protection, two, and especially three, gave excellent control for Rhizoctonia. A greater number of applications did not appear of any value. It is said that this treatment is being tried out on a number of soil-infesting fungi and on different crops.

Effect of environment on potato degeneration diseases, R. W. Goss (*Nebraska Sta. Research Bul. 26 (1924), pp. 4–40, figs. 3*).—A report is given of preliminary studies of some of the practical problems connected with the recognition of degeneration diseases in the potato field, their effect on yield, and methods for control.

The symptoms of potato mosaic in the variety Bliss Triumph are said to be influenced to a great degree by environmental conditions. Temperatures above 70° F. tend to decrease the number and severity of the symptoms, while temperatures below that point increase them. Mottling was found to be the most constant symptom when temperature alone was varied. High temperature with intense sunlight caused the disappearance of this symptom. Wrinkling, curling, and rugosity were eliminated at the higher temperatures on mild mosaic plants. High temperature is said to be a greater factor in masking mosaic symptoms than low moisture or increased sunlight. The symptoms of mild mosaic were found to react more quickly to environmental factors than the more severe types and the combinations of mosaic and spindle tuber used in the author's experiments.

The effect of environment on the symptoms mentioned above is said to be decreased with the increasing age of the plant. Under field conditions mosaic was found more severe on early planted potatoes, while spindle tuber was more severe in the late plantings. Short periods of from four to eight days of high temperature and increased sunlight were found to eliminate the leaf symptoms of mild mosaic and to decrease those of the more severe types. The author claims that climatic conditions can be correlated in commercial fields with changes in the appearance of the symptoms on the plants during the same season, changes in the amount of visible mosaic in different seasons, and changes in the amount of mosaic found in northern-grown seed from Nebraska when planted in Southern States.

In view of the data presented, the author believes that the effect of high temperature, intense sunlight, and low moisture in masking the symptoms of mosaic in western Nebraska is of as great importance as aphid transmission of the disease. The author claims that in order to select healthy seed the conditions under which plants are growing must be considered.

On the cause of rolling in potato foliage; and on some further insect carriers of the leaf-roll disease, P. A. Murphy (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1923), No. 20–24, pp. 163–184, pl. 1, fig. 1*).—A brief review is given of work previously noted (E. S. R., 46, p. 145; 49, p. 753; 50, p. 448).

Systematic experimentation was begun in May, 1922, to determine, if possible, the relationship as regards cause and effect between starch accumulation and rolling of the potato leaves. An examination was made during May and early June, 1922, before any visible symptoms of leaf roll appeared, of the starch content of the lower leaves of plants derived from diseased tubers, all the plants examined afterwards developing normal symptoms of leaf roll. With them were compared corresponding leaves from healthy plants and, in most cases, similar leaves which had already begun to roll from other diseased plants. It is stated that the time of onset of rolling of the leaves varies considerably, even in adjacent similar plants. The comparative examinations were repeated six times from May 25 to June 8, the variety used throughout being British Queen, and the results of the examinations are summarized.

"It was established that the presence of an excess of starch in the rolled leaves of diseased plants is a constant symptom of leaf roll. The rolling of the leaves of diseased plants was found to be preceded by the accumulation of starch in the mesophyll. The artificial darkening of diseased plants before their leaves rolled, and the consequent reduction of photosynthesis to a minimum, was found to prevent the rolling of the leaves for long periods.

"Temporary rolling of the leaves of healthy plants was brought about by depriving the latter of most of their growing points and storage organs. Accompanying the rolling a great excess of starch was found in the rolled leaves. The rolling and excess of starch afterwards disappeared when normal growth was allowed to proceed. It is concluded that rolling of the leaves is a direct consequence of the presence in them of an abnormal amount of starch, and probably of other carbohydrate, and that it is caused by the distention of the spongy parenchyma, which was demonstrated. Starch accumulation in the leaves accompanies rolling due to some other causes, such as injury to the base of the stalk, attacks of black-stalk rot, and other obscure disturbances. Evidence is presented to show that the seat of the disturbance in the translocation of carbohydrate from the leaves of diseased plants resides in the blades of the leaves, where the accumulation of starch begins and ends, and not in the disorganization of the phloem in distant tissues. Low temperatures were found incapable of causing healthy leaves of a living plant to accumulate starch or to roll. The presence of disorganized phloem was established in plants attacked by *Phytophthora infestans* and in others apparently suffering from an attack of eelworms. The disappearance of the starch in diseased leaflets proceeds from base to tip, but in healthy leaflets from tip to base. The brown spots which develop on affected leaves originate in the death of a single cell of the epidermis. It was proved that capsid bugs (*Calocoris bipunctatus*) and jassids (*Typhlocyba ulmi*) act as carriers of leaf roll in the field. Aphids (*Myzus persicae*), when they occur on the sprouts of unplanted tubers, were also shown to be carriers of leaf roll, and to be capable of giving rise to the earliest infestation of the foliage with these insects. The vapor of tetrachlorethane was found a safe and efficient medium for ridding sprouted tubers of aphids."

Losses from mosaic disease, M. G. Medalla and F. B. Serrano (*Sugar Cent. and Planters News, 3 (1922), No. 11, p. 543, 544*).—Mosaic disease of sugar cane is very common on Luzon and in the Binalbagan, Isabela, and San Carlos districts of western Negros, and experimentation has been undertaken in these districts to demonstrate its appearance, methods of transmission, and the possibility of increasing yields by eliminating the disease.

Preliminary results from Negros experiments are given. Already the experiments show that healthy points in a large proportion of cases result in large dark green, healthy stools. Points of cane affected with mosaic disease result in a large proportion of stools which show yellow leaves, mottling, and slight stunting. The germination of points from cane affected with mosaic is usually decidedly poorer than that from healthy cane.

From data as tabulated it is seen that whereas healthy seed shows a germination of from 61 to 99 per cent, points from plants affected with mosaic have only a germination of from 53 to 95 per cent. The greatest loss is in the reduction in cane tonnage of an affected crop.

The dissemination of cane smut, H. A. LEE, G. M. REYES, and F. CLARA (*Sugar Cent. and Planters News, 3 (1922), No. 9, pp. 414–419, fig. 1*).—This account is given in both English and Spanish.

Cane smut is found in Laguna, Batangas, Bulacan, and Pampanga Provinces. It has never been reported from the west coast of Negros, and the Negros Purple cane has, therefore, been considered as resistant, though its occurrence in that cane on the east coast now shows its susceptibility and the probable nonintroduction of smut on the west coast.

Experimentation was instituted to determine the extent of transmission of the disease by points and cuttings, to indicate the loss due to smut, and to determine the extent of other means of transmission. The results are detailed in tabular form with discussion.

"These experiments show that germination of cane points from stools affected with smut is decidedly poorer than is that of points from healthy cane; points or cuttings from stools affected with smut reproduce the disease in a high proportion of cases; there is no cane yield from planting points or cuttings from stools affected with smut; points from healthy cane allowed to soak in the same receptacle with cane from smutted stools showed 8.33 per cent of the resulting cane plants to be affected. This is apparently one method of the spread of the disaese; in the six months duration of the plant crop the spread of the disease into the healthy stools was very slight, only 0.75 per cent of the stools from healthy points showing the disease; the increase of the disease after ratooning amounted to 68.97 per cent of the original healthy stools. This gives us an inkling that in susceptible varieties, infection of healthy stools may take place through the cut surfaces of the stubble. The spread of the disease into the originally healthy stools in the first ratoon crop amounted to 94.44 per cent, or an almost total loss of the ratoon crop. Susceptible varieties of cane such as the Uba can not be successfully ratooned in countries where cane smut is prevalent."

The infection of tobacco plant beds by spitting, W. D. VALLEAU (*Science, 59 (1924), No. 1528, pp. 337, 338*).—The author reports the infection of tobacco in seed beds by both wildfire and angular leaf spot, which was finally traced to the habit of laborers of chewing tobacco and spitting among the plants when working in the beds. The tobacco chewed was mainly dried natural leaf, and the bacteria are known to winter over in the cured leaf.

Tomato diseases and their control, C. G. HANSFORD (*Jamaica Dept. Agr. Microbiol. Circ. 3 (1923), pp. 12*).—Most of the diseases described in the present pamphlet are not restricted to the tomato plant but are found to attack also other plants of the family Solanaceae. These include the stem and leaf diseases, seed bed damping-off (Rhizoctonia, *Fusarium* spp., Botrytis, Pythium, and Sclerotinia, leaf rust or mold (*Cladosporium fulvum*), leaf spotting (*Septoria lycopersici*), tomato wilt (*F. lycopersici*), bacterial wilt or brown rot (*Bacterium solanacearum*), and late blight (*Phytophthora infestans*); the fruit diseases Phytophthora rot, blossom-end rot (*Fusarium* sp.), anthracnose or ripe rot (*Colletotrichum phomoides*), brown rot (*Rhizoctonia* sp.), Phoma rot (*Phoma* sp.), cracking, and dropping of the flower buds; and root nematodes.

[Report of the botanist of the Tennessee Station], S. H. Essary (*Tennessee Sta. Rpts. 1918, pp. 7, 8; 1919, pp. 9, 10; 1920, pp. 15, 16*).—Reports are given of progress made in the development of strains of tomatoes resistant to the blight caused by *Fusarium* sp.

Decay of various vegetables and fruits by different species of Rhizopus, L. L. Harter and J. L. Weimer (*Phytopathology, 12 (1922), No. 5, pp. 205–212*).—A study is reported of 11 species of Rhizopus on 27 different hosts, all of which were found susceptible to decay by some of the species. None of the hosts could be infected without wounding, with the possible exception of ripe peaches. A considerable percentage of peaches and plums in retail markets, decayed with what appeared to be the brown rot organism, were found to have been infected by Rhizopus.

Crown-gall of apple and peach, with notes on the biology of Bacterium tumefaciens, D. Reddick and V. B. Stewart (*New York Cornell Sta. Mem., 73 (1924), pp. 3–19, pls. 2, figs. 4*).—In 1911 apple and peach trees of several varieties were planted, comparisons being made between trees showing no indication of crown gall and others that were manifestly infected. The trees were dug in 1920, and in case of the apple trees, there was no indication that the presence of crown gall on the roots of the trees interfered in any way with their growth. The galls had largely disappeared in practically all cases in which the original tree had a long rootstock and the gall was located near the base of the stock. An examination of the roots showed that the original galls had disappeared completely.

With the peach trees, it is said that none died from the effects of crown gall, and the disease did not affect the growth of the trees to any appreciable extent. For the most part, the galls had either disappeared or were relatively small and insignificant.

The authors conclude that under the conditions of their experiment crown gall was not a factor in the growth and development of either apple or peach trees.

Some biological studies of the organism causing crown gall (*B. tumefaciens*) are presented. In an experiment to determine the persistence of the organism in sterilized soil, pots filled with soil were inoculated on November 10, 1914, and the organism was found alive on May 24, 1915. Tests were made on September 14, 1915, but the organism was not recovered. The moisture relation of the organism was studied in dry, moist, and saturated clay, loam, and quartz. The experiment was begun on February 24, 1914, and on November 18, 1914, the organism was found to be alive except in the cultures in dry clay and dry quartz.

It is concluded that when free from competition, *B. tumefaciens* can live for several months in moist soil of various types, it can withstand low temperatures and repeated changes in temperature at or near the freezing point, and it may move considerable distances with currents of soil water.

Apple scab and its control in Virginia, F. J. Schneiderhan and F. D. Fromme (*Virginia Sta. Bul. 236 (1924), pp. 29, figs. 7*).—The results are given of studies of apple scab (*Venturia inaequalis*) carried on at Winchester, Va., during 1922 and 1923. The authors claim that ascospore discharge in 1922 extended from April 18 to June 12, and in 1923 from April 28 to July 30. The heaviest discharge in both years occurred during the middle portion of May. Ascospore discharges which occurred after the first of June were found of less importance.

A severe epidemic of scab occurred in 1922 as a result of the wet season, which was unusually favorable for ascospore discharge and infection, while in 1923 conditions were reversed and scab infection was of no commercial importance.

Satisfactory control was obtained on such susceptible varieties as Winesap, Rome, and Stayman in 1922 with lime sulphur and Bordeaux mixture. The most important scab sprays in 1922 are said to have been the pink, calyx, and two weeks. The delayed dormant and five-weeks applications were of slight importance, while the late sprays were of no value in scab control. The sprays which were of little or no value in scab control were found valuable, however, in the control of other diseases or of insect pests.

As a result of their investigations the authors recommend a full program of seven applications, as it is considered that the omission of sprays in years of little scab may be accompanied by serious injuries from other diseases or insect pests.

The Panama disease of bananas, C. G. HANSFORD (*Jamaica Dept. Agr., Microbiol. Circ. 1 (1923), pp. [II]+28, pls. 2*).—The first part of this circular gives a brief general account of Panama disease as regards its history, distribution, causation, description, life history, transmission, influencing factors, and experimental work thereon. The second part deals with protective measures, chiefly legal in character.

Citrus-canker control experiments in Japan, H. A. LEE and A. SHINO (*Philippine Jour. Sci., 20 (1922), No. 2, pp. 121-151, pls. 4, fig. 1*).—Reviewing conclusions as noted from a previous (progress) report (E. S. R., 47, p. 845), the authors present herein an account, including data, from more recent work on the prevention of citrus canker upon orange trees of the Washington Navel variety.

"The following results were obtained by these methods: Copper sprays without other treatment reduced the number of fruits affected with citrus canker to as low as 34, 37, and 46 per cent. Untreated plats had percentages of cankered fruits of 80, 86, 92, and 96 per cent. The cost of these spray applications for the season was from 32.4 to 33.7 Japanese sen [16.2 to 16.9 cts.] per tree. Lime sulphur without other treatment reduced canker, but not to such an extent as did the copper sprays. The applications of this spray for the season cost 31 Japanese sen per tree.

"Formalin 1 to 100 solution did not reduce canker. On the contrary, the trees sprayed with formalin had a very slightly larger percentage of cankered fruits than did the controls. The cost of formalin sprays for the season was 1 Japanese yen [50 cts.] per tree, or three times the cost of any of the other sprays. Spraying with copper sprays, accompanied by a removal of the sources of infection before the period of canker activity, reduced the canker percentage on treated plats to 9.25 per cent, 6.5 per cent, and 18.5 per cent. The cost of such treatment was 92 sen for Bordeaux 4-4-50 mixture, 90 sen for neutral Bordeaux mixture, and 92 sen for Burgundy 3-3-50 mixture.

"The trees treated for the removal of sources of infection, without other treatment, showed a reduction to 45 per cent of fruits cankered, at a cost per tree of 59.6 sen. . . . Data are presented to show that wind prevention in itself may reduce citrus-canker development from 50 to 60 per cent to 6, 20, and 37 per cent. This is also corroborated by numerous field observations.

"Data were obtained from the spraying experiments which showed an increase to as high as 25 per cent of sooty mold, 63 per cent melanose, and 100 per cent red spider following the copper sprays. The percentages on untreated plats were less than 3 for sooty mold, and 5 for melanose, and there was no red spider. There were slight increases in these troubles following the lime sulphur applications.

"The injury of citrus canker to the Washington Navel orange is described in detail, and consists of an indeterminable loss to the tree due to a slight reduction in functioning leaf surface, a slight loss due to dropping of fruits infected when young, the loss due to reduction in market value resulting from the blemish on fruits when cankered, a slight reduction in weight of affected fruits, and an infrequent secondary infection with fruit rots following canker infection. These statements do not apply to the more susceptible limes and grapefruits nor to the less susceptible Mediterranean sweet oranges, Satsuma oranges, lemons, mandarin oranges, calamondins, kumquats, or citrons.

"It seems reasonable to conclude that, in countries where citrus canker is already widespread or universal, a feasible control may be obtained upon citrus fruits of the general suspectibility of the Washington Navel. In regions such as Florida and the Gulf States of America, where an attempt is being made to eradicate the disease entirely, preventive sprays would materially lessen the chances for infection. Formalin 1 to 100 . . . is here shown to be entirely valueless as a preventive and, previously, as a bactericide; it is, moreover, three times as expensive as a copper spray. Lime sulphur, or Bordeaux mixtures with an oil emulsion, from these experiments, would seem to be the preventive sprays most effective for this use."

Viability of telia of Cronartium ribicola in early winter, P. Spaulding (*Phytopathology, 12 (1922), No. 5, pp. 221–224*).—An attempt was made to determine how late in the season the telia of *C. ribicola* will remain viable under natural outdoor conditions in Vermont. It is found that the telia on *Ribes nigrum* and, to a lesser extent, on *R. americanum* and *R. cynosbati* remain alive in the winter, and readily germinate when the temperature goes to a few degrees above freezing.

Root rot of pine seedlings, A. E. Rathbun (*Phytopathology, 12 (1922), No. 5, pp. 213–220, fig. 1*).—Roots of *Pinus resinosa* and *P. banksiana* too old to damp-off were inoculated with various fungi, mostly damping-off parasites, and a small amount of root rot was found to be caused by *Rheosporangium aphanidermatus* and a small sclerotial Botrytis. *Corticium vagum* caused a distinct increase in the amount of rot, while *Pythium debaryanum* and the cinerea type of Botrytis caused more or less decay to most of the roots. Strains of *Fusarium* spp. gave variable results, but as a whole Fusarium rot was more serious than in the average controls. Very serious rot also occurred in a series of seedlings inoculated with *Phomopsis juniperovora*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Medical and veterinary entomology, W. B. Herms (*New York: Macmillan Co., 1923, 2. ed., rev. and [enl.], pp. XV+462, figs. 229*).—This is a revised edition of the work previously noted (E. S. R., 34, p. 850).

Methods of estimating insect abundance and damage (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 177–214*).—Papers presented at the annual meeting of the American Association of Economic Entomologists in January, 1924, which constitute a symposium on this subject are as follows: Statistical Methods in Entomology, by J. A. Hyslop (pp. 177–180); Methods of Estimating Abundance and Damage Caused by the Gipsy Moth, by A. F. Burgess (pp. 180–183); The Use of Biometrical Methods in the Interpretation of Codling Moth Experiments, by F. Z. Hartzell (pp. 183–192); Estimating the Abundance and Damage by the San José Scale, by J. J. Davis (pp. 192–195); Methods of Estimating Boll Weevil Losses, by W. D. Hunter (pp. 195–197); Estimating the Abundance of and Damage Done by Grasshoppers, by S. Lockwood (pp. 197–

202); and The Application of Statistical Methods to the Determination of Abundance of and Damage by Hessian Fly, by W. H. Larrimer (pp. 202–207).

Recent observations on insects injurious to cotton, F. G. Holdaway (*Queensland Agr. Jour., 21 (1924), No. 1, pp. 79, 80, fig. 1*).—This is a brief report on two insects which recently caused considerable damage to cotton seedlings in the Rockhampton district of Queensland by attacking the foliage, namely, *Agrotis* sp. (?) and *Neocleptria punctifera* Wlk.

Reports of the assistant entomologist, S. Marcovitch (*Tennessee Sta. Rpts. 1921, pp. 11–16; 1922, pp. 13, 14*).—These reports deal briefly with the projects under investigation, including the strawberry weevil, strawberry crown borer, and strawberry root louse. A detailed report of investigations of the crown borer, published in Bulletin 128, has been noted (E. S. R., 50, p. 760), as has an account of the injury of the strawberry weevil to buds of other fruits and to the redbud (E. S. R., 47, p. 855).

Reports of the associate entomologist, G. M. Bentley (*Tennessee Sta. Rpts. 1916, pp. 14–16; 1917, pp. 13, 14; 1918, pp. 13–16, fig. 1*).—These consist of brief accounts of the more important insect pests for the periods under report and of control measures.

A new type of light trap for insects, C. B. Williams (*Egypt Min. Agr. Tech. and Sci. Serv. Bul. 28 (1923), pp. 2, pls. 2*).—This is a description of a portable light trap for use in the field, developed in the course of work on cotton pests in Egypt.

The effectiveness of calcium cyanide in the extermination of the black tail prairie dog, Cynomys ludovicianus (Ord.), O. Wade (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 339–342*).—The author reports upon tests made in Kansas in 1922 and 1923 of calcium cyanid as a means of control for prairie dogs. The flake form of the chemical, used in dosages of 0.75, 1, 1.5, and 2 oz., was placed in each burrow entrance from 1 to 2 ft. below the rim. In three "dog towns" doses of 1, 1.5, and 2 oz. were used and all entrances to dens closed, total kills resulting in each instance. Eight infested areas were treated with 0.75-, 1-, and 1.5-oz. doses, and all burrow entrances left open. In the two tests with 1.5-oz. doses total kills were obtained. Complete extermination resulted in one test with 1-oz. doses. In the remaining five tests, where doses of 0.75 to 1 oz. were used, the effectiveness varied from 90 to 99 per cent. The killing power of the chemical in open burrows is an important factor, since the closing of burrows involves considerable time and labor.

Preliminary tests in Kansas, in which doses of 1 and 2 oz. were used, indicate that calcium cyanid might be effectively used in the eradication of the pocket gopher, *Geomys bursarius* (Shaw).

Recent developments in greenhouse fumigation with hydrocyanic-acid gas, E. R. Sasscer and C. A. Weigel (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 214–222, figs. 3*).—The authors report that a simple device adapted to simultaneously dropping cyanid into generators has been developed and proved practical in commercial greenhouses, liquid hydrocyanic acid (equivalent to 0.75 oz. of sodium cyanid per 1,000 cu. ft.) being effective against several species of aphids, white fly, and scale insects. At low temperature, 1 oz. of sodium cyanid per 1,000 cu. ft. was not effective against the eggs of *Pseudaonidia duplex* (Ckll.). Preliminary notes on the use and effectiveness of calcium cyanid indicate that it may become useful as a greenhouse fumigant. Information on plant tolerance of Kentia and Areca palms for sodium cyanid fumigation is presented.

The use of calcium cyanide for the control of fleas and other insects, K. C. Sullivan (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 230–237*).—In work at the Missouri Experiment Station, calcium cyanid was successfully used for the control of the dog flea (*Ctenocephalus canis* Curtis) and the human flea (*Pulex irritans* L.) in both open and closed buildings. Used at the rate of 4 oz. per 100 sq. ft., it will give practically 100 per cent kill in closed buildings, and 8 oz. to 100 sq. ft. in open buildings will give the same results. Calcium cyanid dust was successfully used for controlling striped blister beetles in gardens. Used at the rate of 1 oz. to 1,500 cu. ft. of space, the dust gave a 95 per cent kill of greenhouse white fly in greenhouses without any injury to plants. It gave fair results when used at the rate of 1 oz. to 25 cu. ft., 1 oz. to 50 cu. ft., and 1 oz. to 100 cu. ft., for periods varying from 45 minutes to 1 hour, for the control of San José scale on nursery stock, apple, and peach.

Notes on the use of chlorine gas as an insecticide, T. L. Guyton (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 307, 308*).—The author reports that trials in the use of chlorin gas as an insecticide in the control of the Angoumois grain moth resulted in the loss of germination to the treated wheat and an incomplete kill of the moths.

The estimation of dosage for volatile dusts: An illustration of the value of correlation mathematics to entomology, F. Z. Hartzell (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 279–285*).—The term volatile dust is proposed by the author for materials which kill insects by the evolution of toxic gases. He suggests that dosage with such preparations be defined as the number of cubic feet of tree volume and tree space occupied by 1 lb. of dust. Experiments with volatile dusts for the control of pear psylla in western New York have indicated that, for this insect, on the basis of tree volume, 1 lb. of dust should not occupy a space of more than 1,500 cu. ft., and, on the basis of tree space, the maximum volume should be 1,900 cu. ft. Correlation and partial correlation calculations were used to study the relation of efficiency to dosage, temperature, and percentage of open space. Dosage was found to exert the greatest influence. The effect of temperature was not as marked as laboratory studies indicate, and this was, doubtless, due to the increased convection currents and decreased humidity that usually accompany rise in temperature under field conditions.

Certain dusts as agents for the protection of stored seeds from insect infestation, T. J. Headlee (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 298–307*).—Investigations at the New Jersey Experiment Stations show that common white edible beans are protected from later attack by the bean weevil when mixed in proper proportions with ground burned lime, hydrated lime, calcium chlorid, calcium sulphate, dolomite, Highland Clay, Bond D Clay, and Milltown Ball Clay No. 9.

"The protection which is afforded by these materials is most marked in the case of Milltown Ball Clay No. 9, and seems not to be connected with atmospheric moisture or chemical state of the dust materials. The protective ability of these materials appears to be correlated with the degree to which they exhibit a colloidal character, the more colloidal the more effective, the less colloidal the less effective. This physical character seems to operate through preventing the larva of the bean weevil from obtaining sufficient foothold upon the surface of the bean seed to drill its way into the bean. Milltown Ball Clay No. 9, which is the most colloidal of all the dust materials worked with, appears to afford protection to wheat and shelled corn from later attack by the Angoumois grain moth (*Sitotroga cerealella*). This clay apparently also has an insect reducing power when not in direct contact with the immature stages of the insects themselves. This insect infestation reducing power appears both in the case of the bean weevil and the Angoumois grain moth."

Spreader tests on apples and peaches: A second report, L. A. STEARNS and W. S. HOUGH (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 274-278*).—The efficacy of a casein spreader (Kayso) in the commonly recommended sprays for apple and peach has been studied in Virginia for the second season (E. S. R., 49, p. 353). These sprays, with and without the spreader, were mixed by the authors and applied by the regular orchard force. There was no indication that the incorporation of the spreader with the usual sprays influenced the protection of the fruit from insects and diseases. It is concluded that the use of a casein spreader in the apple and peach sprays under orchard conditions in Virginia is not justified from the standpoints of effectiveness and economy.

Some side lights on spray injuries to apple fruits and foliage, P. J. PARROTT (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 267-274*).—This report deals with the effect of different materials on the foliage and fruit of apples. It appeared that all the spray and dust mixtures affected to some degree the surfaces of apple fruits. "Sun scald" or "spray burn" was the most conspicuous type of injury and was common in all of the plats receiving applications of sulphur either as lime sulphur solution or flowers of sulphur, or of sulphur flour applied as a dust. Russeting varied in intensity with the different treatments. Injuries to foliage were largely confined to plats sprayed with lime sulphur solution. The addition of calcium caseinate, glue, and lime hydrate reduced to some extent injuries to both fruits and foliage, but they did not prevent important injury to foliage in some instances.

Thrips: An unpopular insect, treated popularly, R. KELLY (*Victorian Nat., 40 (1923), No. 3, pp. 49-57, pl. 1*).—This paper, which includes an account of observations by the author, presents a list of Australian species and also a list of Papuan thrips by R. S. Bagnall.

Cyanide for bedbugs, A. L. STRAND (*Montana Sta. Circ. 123 (1924), pp. 7, figs. 3*).—Directions are given for the use of hydrocyanic acid for the control of *Cimex lectularius* L.

Controlling chinch bugs in Missouri with calcium cyanide, L. HASEMAN and S. W. BROMLEY (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 324-329*).—The authors report that calcium cyanid did not prove practical when sown broadcast in infested wheat fields or when applied as a line barrier on the surface of the ground. In tests where it was applied in a narrow strip or trap crop between wheat and corn fields, it proved promising. The best results were secured when the material was distributed in a narrow line in the bottom of a deep, narrow furrow such as made with a plow. The furrow should have practically a vertical wall next to the crop to be protected and a line of the chemical placed at the foot of the vertical wall. One lb. of calcium cyanid flakes to each 60 ft. of furrow, applied in the afternoon when heavy migration of bugs began, proved effective in destroying the bugs for the rest of the day. This required about 22 lbs., costing $4 a day, for material used in 0.25 mile of barrier.

The grape leaf-hopper in Arizona, C. T. VORHIES (*Arizona Sta., Timely Hints for Farmers, No. 146 (1924), pp. 14, figs. 9*).—This is an account of *Erythroneura (Typhlocyba) comes*, the most important insect enemy of the grape in Arizona, where, with the recently increased number of plantings, especially in the Salt River, Yuma, and Casa Grande Valleys, it has become the source of considerable loss. In this account of the pest the author refers to investigations that have been conducted in New York (E. S. R., 27, p. 157) and more particularly to the studies of Quayle in California (E. S. R., 20, p. 557). During 1923 studies of the pest were conducted in the three districts above mentioned and to some extent locally at Tucson, but especially in the vicinity of Casa Grande.

It is stated that in southern Arizona the adults are more or less active throughout the winter on a wide variety of plants other than the grape. In that locality it first appears, as a rule, early in April and may become injuriously abundant early in May, although overwintered adults are not ordinarily abundant enough to cause noticeable damage. At Casa Grande a few young observed on May 1 indicated that the eggs must have been deposited at least two weeks earlier. Nymphs of the first generation reach maximum abundance from May 10 to 15, and by the latter date a few may have transformed to adults. There are said to be two generations and probably a partial third in southern Arizona. Control work consists of the application of a solution of Blackleaf 40 (0.5 pint to 100 gal. water) with a power sprayer or dusting (10 per cent nicotin dust) with small machines in May, when the young of the first generation are most abundant.

The summer food plants of the green apple aphid (Aphis pomi), E. M. PATCH (*Maine Sta. Bul. 313 (1923), pp. 45–68, figs. 8*).—The author finds that, while the entire life cycle of *A. pomi* has been followed by Baker and Turner on apple alone (E. S. R., 34, p. 754), the species also develops winged forms early in the summer on apple, which fly not only to fresh, vigorous shoots of apple but also to a wide range of other vegetation, where colonies are established which thrive during the summer. The small aphids, which are abundant on weeds, plants in flower gardens, and vegetables, and are only summer residents, have been found by the author to represent three species, namely, *A. pomi*, *A. gossypii*, and *A. abbreviata*. A table is given for their separation. It is pointed out that *A. pomi* and *A. abbreviata* each throws two strong color varieties, one green and one yellow, and are found in all the intergrading blends, while the color range of *A. gossypii* is of common comment.

The author calls attention to the fact that the primary food plant of an aphid is that plant on which it habitually deposits its overwintering eggs and on which develop at least two spring generations, the first or stem mother and the second or her immediate progeny. *A. pomi* has previously been recognized by that name only on its overwintering or primary food plant, while both *A. abbreviata* and *A. gossypii* were named from summer form material, and probably both are known by other names on their primary food plants. The account of the life cycle of *A. pomi* by Baker and Turner is quoted from. In addition to the apple, the summer forms accept a wide range of unrelated food plants, to which winged forms migrate in the early summer and from which fall migrants depart late in the season to return to the primary food plant, on which the species overwinters. A list of the summer food plants, including representatives from 24 families, is presented. The overwintering food plants of *A. pomi* include the mountain ash, apple, Japan quince, pear, and *Spiraea vanhouttei*. The author's methods of study are described, questions of synonomy and variability are discussed, and brief reference is made to the economic status of the species.

The Houghton gooseberry aphis (Myzus houghtonensis) as a pest in Ohio, D. M. DELONG and A. A. MATHEWSON (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 295–298, pl. 1*).—This aphid injures gooseberries by forming leaf galls, the leaves becoming stunted, tightly curled, and dying, as a result of which little fruit is produced, and this is inferior in quality.

"The gall gives rise to a witch's broom by the formation of numerous abnormal shoots. The insect overwinters as an egg on the canes. The eggs begin hatching early in April. The first winged generation appears about the middle of May, and migration takes place. They become reestablished on the gooseberry, and several wingless generations are found here during the summer and autumn. A second winged generation is produced in late October, and the eggs are deposited a little later on gooseberry. This insect may have an alternate food plant, but is able to survive normally on gooseberry alone."

Comparative tests with dormant sprays for San José scale control, J. J. Davis (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 285–289*).—In 3 years' work at the Indiana Experiment Station, lime sulphur did not give a sufficient kill to check the scale, which corroborated the results obtained by commercial orchardists in southern Indiana. Lime sulphur is still an effective scale control in most sections of northern Indiana, and dry lime sulphur was about as effective as the liquid concentrated provided it was used at one and one-half to two times the strength recommended by the manufacturers. It is stated that under conditions existing the past few years in most of southern Indiana, the oil sprays, including the miscible oils, "petroleum soaps," and oil emulsions, are the only ones which have given satisfactory control. The summer use of oil emulsion can not be recommended to take the place of a dormant spray, although under certain conditions a summer application materially assists in checking scale.

The use of lubricating oil emulsion on greenhouse scale insects, C. C. Compton (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 222–225*).—The author reports that in work at Urbana, Ill., lubricating oil emulsion spray at 1 per cent strength has proved very effective in controlling scale insects under greenhouse conditions. No injury to palms has resulted from the spray at this strength with the exception of one case of very slight injury when the application was made on a very cloudy day. On bright, sunny days a spray at 2 per cent strength has been used without injury, but is not recommended.

Field experiment in spraying for control of San José scale in 1923, F. E. Carver (*Ill. State Hort. Soc. Trans., 57 (1923), pp. 233–240*).—The experiments reported have shown Diamond Paraffin oil emulsion to give much better control of San José scale than lime sulphur.

"Lime sulphur checked San José scale but did not control it satisfactorily. A 3 per cent dormant application of the oil emulsion was better than a 2 per cent dormant application. A 2 per cent dormant application of the oil emulsion was better than four summer applications of the 2 per cent emulsion. Summer applications of the oil emulsion with the regular sprays following a 3 per cent dormant application proved better than the dormant application alone. Summer applications of the oil emulsion with the regular sprays without a dormant application were beneficial. Summer applications of the oil emulsion separate from the regular summer sprays and following a 3 per cent dormant application proved the best combination of sprays this year. Summer applications of the oil emulsion are not necessary or advisable except in case of an emergency. Bordeaux emulsion gave good control, but was inferior to the regular oil emusion; this may be due to the difference in the times of application."

The time of planting corn as a factor in corn-ear worm control, J. W. McColloch (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 320–323*).—The author reports that experiments under way at the Kansas Experiment Station for 10 years have shown that there is a definite relation between the date of planting corn and injury by the bollworm. As a rule, the date of minimum bollworm injury and maximum yields coincide.

Observations on an outbreak of Utetheisa bella L., M. T. Smulyan and R. T. Webber (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 337–339*).—This is a report of observations of the arctiid moth *U. bella* on *Crotalaria sagittalis* in Somerset County, N. J.

Three years of paradichlorobenzene experiments in the South, O. I. Snapp (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 253–259*).—This is an account of experiments with paradichlorobenzene conducted by the U. S. D. A. Bureau of Entomology in the South. It is stated that treatment of peach trees for control of the peach borer has become an annual practice in the program of orchard management in Georgia, and that 500,000 lbs. of the material were used in the Southeast during the 1923 season. The experiments show that under normal conditions large doses exposed for short periods are not as effective as the smaller doses exposed for from four to six weeks.

"No tree injury resulted from the use of the various doses around 3-, 4-, and 5-year-old peach trees in Georgia during 1921 and 1922, when normal weather conditions prevailed. However, during the 1923 season a precipitation deficiency occurred accompanied by abnormally high temperatures. These unusual weather conditions caused rapid action from the gas, and as a result some rather severe injury has shown up on 3-year-old trees from the use of the 0.75- and 1-oz. doses. During each of the 3 years no injury has resulted from the use of the 0.75-oz. dose around 4- and 5-year-old trees for 28 days. One- and 2-year-old trees have shown, each year, more or less injury from the use of the 0.5- and 0.75-oz. dose.

"To date no injury has been revealed from allowing the mounds to remain around the trees over winter. Late October and November applications of paradichlorobenzene gave a control of around 75 per cent. December applications were worthless. Applications made around April 1 in Georgia gave about 70 per cent control. Laboratory experiments show that the gas is liberated at about the same rate in both sandy loam and clay soils. Tests in the laboratory have repeatedly shown that the higher the moisture content of the soil and the lower the temperature, the slower is the action of the gas on the borer."

Some recent developments in the use of paradichlorobenzene, S. C. Chandler (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 246–251, fig. 1*).—Experiments and observations by the author on the peach borer in Illinois during the past four years are said to have shown that grass and weeds need not be removed from around the base of the tree before applying paradichlorobenzene, and that heavy rains just before or just after treatment do not affect the action of the gas.

"One-year trees have not been injured when treated with paradichlorobenzene in the proper manner. It is not necessary to remove dirt from around the trees after treatment. Up to the present time, there have been no injurious cumulative effects of paradichlorobenzene in Illinois. Paradichlorobenzene packed closely against the bark of young peach trees will kill a large percentage of the trees. No injury was produced by paradichlorobenzene in experiment with apple trees. Two-oz. application per tree is suggested as advisable for 12-year-old trees."

Caenurgia erechtea (Cram) (Noctuidae) as an alfalfa pest in Kansas, R. C. Smith (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 312–319, figs. 9*).—This insect is said to be common in alfalfa, clover, and pastures of Kansas, occasionally becoming numerous but not seriously injurious.

Should the midsummer apple spray be timed for the second brood only of codling worm? H. A. Gossard (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 265, 266*).—The author reports that studies of the life history of the codling moth have been made, partially or fairly complete, at Marietta in southern Ohio, at Wooster in the north central section, and at Gypsum in the northwestern section. Records of the dates when the sprays are commonly applied have also been kept through a series of years. The tentative conclusion is reached that when the season is late the summer spray should be earlier than usual instead of later, and that a later second summer spray is desirable in such a year.

Oriental fruit moth in Pennsylvania in 1923, T. L. Guyton (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 259, 260*).—The author reports that in 1923 *Laspeyresia molesta* Busck caused a heavy loss to fruit growers in the southeastern part of the State.

Two bacterial parasites of the larvae of Neurotoma nemoralis [trans. title], A. Paillot (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 2, pp. 246–249, fig. 1*).—Notes are presented on two organisms parasitic in *N. nemoralis*, to which the author gives the names *Bacillus neurotomae* and *Micrococcus neurotomae.*

The Mexican bean beetle in Kentucky, H. Garman (*Kentucky Sta. Circ. 31 (1923), pp. 3–16, figs. 8*).—This is a summarized account of *Epilachna corrupta*, which has spread into Kentucky, where during the years 1922 and 1923 it caused severe injuries. By the end of the year 1923 it had spread over two-thirds of eastern Kentucky and occurred in isolated spots in the more northern parts of the State. Recent accounts by Thomas, in Alabama (E. S. R., 50, p. 758); by Miller in Ohio (E. S. R., 50, p. 156; 51, p. 256); by Bentley, in Tennessee (E. S. R., 50, p. 849); and by Chittenden (E. S. R., 50, p. 848) have been noted. Its occurrence in four counties in Ohio shows that its presence may be expected anywhere in eastern Kentucky.

A new apple pest, Metachroma interruptum, W. P. Flint (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 260, 261*).—Notes are presented on the attack of apple and peach in Illinois by the willow beetle, *M. interruptum* Lec.

Further studies of prune root borer control in Oregon, F. H. Lathrop and V. Trask (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 290–295*).—This is a report of experiments conducted in Oregon during the season of 1922 in the control of the prune root borer (*Sanninoidea opalescens* Edw.), in which naphthalene whitewash and the application of paradichlorobenzene were tested.

"The naphthalene whitewash consisted of a basic formula composed of quicklime, copper sulphate, glue, and ground wood pulp, with sufficient water to form a thick paint. To this were added mixtures of naphthalene and paraffin in solid solution or naphthalene alone. The wash was applied to the tree trunks to a height of 14 to 16 in. after the soil had first been removed and the bases of the trees protected from the naphthalene fumes by means of paper collars or by a preliminary 'protective' wash.

"In general, the treated plats showed a reduction in infestation. Best results were secured by the use of naphthalene paraffin mixtures applied in connection with a preliminary protective wash. Applications of 1 oz. of paradichlorobenzene about the bases of the trees during the first week of September gave excellent results when left undisturbed until the following spring. Larvae situated some distance above the soil level were not affected by the treatment. In heavy soils the action of the material was slower than in lighter soils. When this material was improperly applied or very young trees treated, severe injury resulted to prune trees."

An Asiatic beetle (Anomala orientalis) in Connecticut, W. E. Britton (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 309–311*).—The author reports that specimens of *A. orientalis* were collected in a nursery in New Haven in 1920 and 1921, and that the larvae of this beetle were a source of injury to roots of grass in lawns in the vicinity in 1923.

Experiments on egg production in Bruchus, A. Brauer (*Okla. Acad. Sci. Proc. [Okla. Univ.], 1923, III, pp. 78–83*).—Experiments here reported were conducted with a view to determining the optimum temperature at which the weevils deposit their eggs.

New developments in alfalfa weevil activity and control, C. WAKELAND (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 330–337, figs. 3*).—This is a report of studies at the Idaho Experiment Station, in which it was determined that, under conditions such as prevailed in southwestern Idaho in 1923, when there was a prolonged period of egg hatching, two sprays applied to the first crop of alfalfa are needed to afford protection from the alfalfa weevil.

Beekeeping in Colorado, N. BOGGS (*Colo. Agr. Col. Circ. 41 (1923), pp. 18, figs. 7*).—This is a revision of Circular 37, previously noted (E. S. R., 50, p. 158).

Paratyphoid of the honeybee and investigations of the occurrence of bacteria of the colon-typhoid group in their intestines [trans. title], L. BAHR (*Arch. Bienenk., 4 (1922), No. 5–6, pp. 1–37, pl. 1*).—The author reports upon investigations of a disease caused by an organism described as *Bacillus paratyphi alvei*, conducted in continuation of those previously noted (E. S. R., 47, p. 259). The paper includes a list of 30 references to the literature.

FOODS—HUMAN NUTRITION.

The value of sweet potato flour in bread making, H. C. GORE (*Indus. and Engin. Chem., 15 (1923), No. 12, p. 1238*).—The use of a small amount of sweet potato flour in bread making has been found to result in a substantial increase in the volume of the loaf with no deterioration in texture, color, or flavor. The baking tests were made by the straight dough method with the following formula: Flour 450 gm., salt 7, sugar 16, and yeast 10 gm., with sufficient water to produce a dough of proper consistency. The sweet potato flour was mixed with the liquid ingredients before the wheat flour was added. The best results were obtained with 1½ per cent of sweet potato flour.

Demonstration showing the baking qualities of adlay flour in batters and doughs other than yeast bread, M. C. DENTON and E. HOFFMAN (*Philippine Agr. Rev., 16 (1923), No. 3, pp. 205–211*).—Recipes developed at the Office of Home Economics, U. S. D. A., for the use of adlay flour alone or with wheat flour in the preparation of muffins, cakes, wafers, nut bread, pastry, and puddings are given, with general comments on the baking qualities of adlay.

Two samples of flour, of 99 and 60 per cent extraction, were used in a demonstration luncheon. Both samples are described as having some of the characteristic properties of corn meal and as having the same disadvantages in the preparation of certain types of dough. It was found impossible to make biscuits successfully from the flour by the usual method, but successful drop or emergency biscuits were prepared. In pastry the flour can be used up to about one-third of the entire amount of flour, but beyond this the texture becomes mealy as in the case of corn flour.

Cuban fruits, J. DE CÁRDENAS and E. MORENO (*Las Frutas de Cuba. Habana: Sec. Agr., Com. y Trab., Dir. Agr., Lab. Quim. Agr., 1923, pp. 63, figs. 25*).—Data are reported on the composition, nutritive value, and coefficients of digestibility of 27 Cuban fruits.

The viability of intestinal pathogenic bacteria in fruits and Philippine foods eaten raw, A. VASQUEZ-COLET (*Philippine Jour. Sci., 24 (1924), No. 1, pp. 35–39*).—Various Philippine fruits and other foods commonly eaten without cooking were inoculated with cultures of cholera vibrio, *Bacillus typhosus*, and *B dysenteriae* and tested from time to time for the presence of these organisms. The survival period of the cholera vibrio appeared to be from a few hours to at least six days, of the typhoid bacillus from a few minutes to three days, and of the dysentery bacillus from a few minutes to five days.

Molds on frozen meats, A. M. Wright (*Jour. Soc. Chem. Indus., 42 (1923), No. 50, pp. 488T–490T*).—As the result of an investigation conducted in England and New Zealand of mold growth on frozen meats, the author has concluded that "black spot" is not the result of the growth of any one mold but of several species. *Cladosporium herbarum*, reported by Brooks and Kidd (E. S. R., 46, p. 860) to be the sole causative organism of black spot, was in the author's experience the least common of the molds found. In order to prevent mold development in cold storage it is considered necessary that the meats be held at temperatures not higher than —9° C. (15.8° F.) Prolonged cold storage is in itself considered to have no effect on mold development.

Maintenance values for the proteins of milk, bread-and-milk, meat, and soy bean curd in human nutrition, M. S. Rose, G. MacLeod, and B. Bisbey (*Soc. Expt. Biol. and Med. Proc., 21 (1923), No. 3, pp. 143, 144*).—Data are summarized on the nitrogen balance of two subjects for periods of from 12 to 15 days on a low protein diet supplemented by one of the foods listed in the title. The basal diet consisted of arrowroot starch, dextrimaltose, lactose, butterfat, and apple. This never yielded more than 3 per cent of the total nitrogen, the rest coming from the food under investigation, which was taken in amounts to yield from 0.077 to 0.08 gm. of nitrogen per kilogram of body weight daily.

The average nitrogen balance for 12 days of the subject taking soy bean curd was +0.03 gm. For the other subject, in successive 12- or 15-day periods each preceded by a short period of adjustment, the nitrogen balances were as follows: For meat +0.06, milk +0.55, and milk-and-bread +0.41 gm.

As a further indication of the relative efficiency of the four sources of protein used, figures are given for the total protein storage by 12-day periods. These were with soy bean 2.12, meat 4.33, milk 41.44, and bread-and-milk 30.37 gm. An additional comparison was made by assuming a food to be efficient for maintenance when nitrogen equilibrium can be established on 0.08 gm. of nitrogen per kilogram of body weight, with an energy intake adequate to maintain body weight and assigning this a value of 100 per cent. The corresponding values for the foods under consideration were for soy bean 101, meat 101, milk 121, and milk-and-bread 116.

The effect of various carbohydrates and amino acids on the sugar in the blood and urine of the healthy organism [trans. title], A. Schätti (*Biochem. Ztschr., 143 (1923), No. 3–4, pp. 201–220, figs. 17*).—Determinations of the blood sugar by the Bang method and the urine sugar by the Benedict method are reported for samples of blood and urine taken at half-hour intervals for 4 hours after the ingestion of definite amounts of the substances under investigation, these being taken from 13 to 15 hours after a uniform evening meal.

Following the ingestion of 20 gm. of carbohydrate there was an increase in the amount of blood sugar in decreasing order of glucose, levulose, sucrose, lactose, and galactose. The ingestion of the same amount of starch had no effect. The two amino acids tested, alanin and glycocoll, were without effect upon the blood sugar. The urine sugar varied with the blood sugar.

Applied pharmacology, A. J. Clark (*London: J. & A. Churchill, 1923, pp. VIII+390, figs. 46*).—In the three chapters in this volume devoted to the pharmacology of the alimentary canal, the author discusses the normal functions of the alimentary canal and the action of various drugs upon salivary secretion, gastric digestion, and the passage of food through the intestines. Various purgatives are classed as those which act by increasing the volume of nonabsorbable residues, those which act by irritating the mucous membrane, thus increasing peristalsis as a reflex action, and those which act by stimulating the neuromuscular mechanism directly. Other chapters of interest in this section are those on the pharmacology of the kidneys, the pharmacology of temperature regulation, the vitamins, the pharmacology of the endocrine glands, and the pharmacological action of the products of protein breakdown.

An investigation of the results of the operation for enlarged tonsils and adenoids, J. Keen (*Med. Officer, 31 (1924), No. 8, pp. 75–78, figs. 4*).—Among the comparisons made in this study of the results of the removal of enlarged and diseased tonsils and adenoids from over 600 school children was the extent of malnutrition before and after the operation as determined by the Wood standards.

Before the operation there were 89 boys and 78 girls who were more than 10 per cent under the standards for their age, while the examination by the same standards one year after the operation gave corresponding figures of 50 and 46. This represents a reduction of 44 and 41 per cent in the number of malnourished boys and girls, respectively.

The behavior of inorganic phosphate in the blood and urine of normal and diabetic subjects during carbohydrate metabolism, W. A. Perlzweig, E. Latham, and C. S. Keefer (*Soc. Expt. Biol. and Med. Proc., 21 (1923), No. 1, pp. 33, 34*).—The authors report that in connection with studies on diabetes conducted at the Johns Hopkins Hospital, it was found that in normal human subjects the ingestion of from 50 to 100 gm. or glucose and the intravenous injection of 3.5 units of insulin caused a marked fall in the inorganic phosphate of the blood, accompanied by a fall in the rate of excretion of phosphate in the urine. The subcutaneous injection of 0.5 cc. of a 1:1,000 solution of epinephrin also caused a fall in the inorganic phosphate of the blood, which was, however, frequently accompanied by a rise in the rate of urinary excretion of phosphate. The ingestion of glycerol caused a marked lowering in the excretion of phosphorus, which was accompanied by a lowered respiratory quotient instead of the rise in respiratory quotient following the injection of insulin or epinephrin.

With diabetic subjects the ingestion of glucose or the injection of insulin did not always cause a retention of phosphate, especially when the blood sugar curves and the respiratory quotient indicated that there was no increased catabolism of carbohydrate. No general relationship was found to exist between the retention of phosphate and the reaction of the urine as measured by the total titratable acidity. Contrary to the suggestion of Wigglesworth et al. (E. S. R., 51, p. 271), no evidence was obtained which might indicate the presence in the blood of a carbohydrate phosphate compound.

Insulin as an investment for the patient with diabetes mellitus, R. Fitz and W. P. Murphy (*Jour. Amer. Med. Assoc., 82 (1924), No. 6, pp. 435–438, figs. 7*).—This paper attempts to estimate the actual returns to the diabetic patient in increased physical strength, working ability, and earning capacity resulting from a given expenditure for insulin. Five cases were selected for study as representing the various types of severe diabetes most commonly seen in general practice. Three of these were adults, in the case of two of whom it was possible to estimate from the earning capacity and after treatment what is called the dividend from insulin, or the difference between the cost of insulin per month and the increased earning capacity. This represented in the two cases studied dividends of $20 and $15 per month. In the case of the third adult, the expenditure of $250 for insulin in 10 months resulted in a gain of 15 lbs. in weight, restored eyesight through an operation which would not have been possible otherwise, and sufficient strength to resume work. The gains in the cases of juvenile diabetes were calculated in terms of increased strength and activity, both physical and mental.

In conclusion it is stated that there are two classes of diabetic patients, those to whom insulin is a necessity and those to whom it is a luxury. "As a general rule insulin should be given in all cases of diabetes occurring in children and in people under 40, in all cases of coma or severe acidosis, in all cases complicated by an infectious process which has caused either a temporary or a permanent lowering of tolerance, in all cases of proved severity in which there is necessity for a surgical operation, and in all cases in which the tolerance without insulin, as determined by adequate dietetic control, is so low as to make efficient living impossible. No one should hesitate to urge such patients to take insulin at all costs, for the drug may be life saving and almost always represents a sound financial investment for the patient, with a big dividend of strength and vitality."

The feeding of odd carbon fatty acid fats to diabetic patients, M. Kahn (*Soc. Expt. Biol. and Med. Proc., 21 (1923), No. 1, pp. 31, 32*).—In this brief note on the utilization of the synthetic, odd-carbon fat, intarvin (the glyceryl ester of margaric acid), the author states that it is absorbed in the body to the extent of 95 per cent. Experiments conducted on phlorhizinized dogs indicate that, in these animals at least, it is broken down to propionic acid and then converted to glucose. It is considered to be of special value in the dietary treatment of diabetes in the case of individuals on whom insulin appears to have no or only a moderate effect. In such cases the fat may be safely administered in portions yielding as much as 1,000 calories daily. A table is given, showing the amount of glucose and ketones in the urine, and glucose and carbon dioxid in the blood, following the feeding of this fat to a diabetic and tubercular individual.

Simple diet charts for diabetes of all grades of severity, F. H. McCrudden (*Jour. Amer. Med. Assoc., 82 (1924), No. 5, pp. 356–359, figs. 4*).—The calculations, tables, and charts presented are based on the Shaffer-Woodyatt standards for ketogenic and antiketogenic values of carbohydrate, protein, and fat and the minimal protein requirement as estimated by Sherman (E. S. R., 42, p. 459). The principle upon which the calculations of diabetic diets are based is that the functional efficiency of a diabetic patient may be determined by dividing the glucose-oxidizing capacity in grams by the basal metabolism in calories. This ratio multiplied by 1,000 to give whole numbers is referred to as glucal units, which represent the severity of the diabetes.

Charts are given in which curves for carbohydrate and fat, respectively, have been calculated for given values of basal metabolism in calories as abscissas and severity in glucal units as ordinates. Tables are also given in which the glucal units have been calculated in terms of carbohydrate and basal metabolism and fat and basal metabolism. "Further research may somewhat modify these values and, therefore, the exact quantities of protein, carbohydrate, and fat in any individual case, and it may lead us to modify certain details, as, for example, our method of defining or determining glucose-oxidizing capacity. But that will not affect the principle involved, namely, that diabetic diets should be individualized with respect to the basal metabolism of the patient and functional efficiency as expressed by the general formula F. E.$=\frac{\text{Capacity}}{\text{Requirements}}$."

The action of vitamins [trans. title], W. R. Hess (*Deut. Med. Wchnschr., 50 (1924), No. 6, pp. 163, 164*).—A discussion of the author's investigations, which have been noted previously (E. S. R., 47, p. 862).

Contribution to the knowledge of vitamins A and B [trans. title], T. De Sanctis-Monaldi (*Ann. Ig.* [*Rome*], *33 (1923), No. 11, pp. 771–783, figs. 5*).—

Feeding experiments are reported which were conducted on pigeons to test the value of ox bile and infusions of roasted walnuts, hazel nuts, and almonds as sources of antineuritic vitamin, and on white rats to test the value of roasted almonds as a source of vitamin A.

All of the substances tested for antineuritic properties appeared to have the power of ameliorating for a short time the polyneuritic symptoms in pigeons on a polished rice diet. The 10 per cent aqueous infusion of roasted almonds, which had shown antineuritic properties, did not give evidence of containing vitamin A, but the roasted nuts fed as such in a diet deficient in vitamin A promoted normal growth in white rats.

The presence of vitamin A in commercial lecithin [trans. title], F. Eichholtz (*Biochem. Ztschr., 144 (1924), No. 1-2, pp. 70, 71*).—A limited amount of evidence is reported indicating that Witte's lecithin contains vitamin A.

The antiscorbutic property of sweetened condensed milk [trans. title], E. Lesné and M. Vagliano (*Compt. Rend. Soc. Biol. [Paris], 90 (1924), No. 6, pp. 393, 394, fig. 1*).—Sweetened condensed milk tested after a period of 15 months' storage in sealed cans was found to have as high antiscorbutic properties as when first prepared. This is attributed either to the absence of air or to the presence of sugar.

The vitamin content of bread [trans. title], S. Hara (*Biochem. Ztschr., 144 (1924), No. 1-2, pp. 52-59, figs. 5*).—This paper reports the results of feeding experiments on rats to test the value as a source of vitamin B of German war bread consisting largely of rye, with a little wheat and barley flour. The rats received the basal ration free from vitamins B and C but containing vitamin A employed by the author in previous studies (E. S. R., 50, p. 856). As shown by preventive and curative tests, the bread was fairly rich in vitamin B. In comparison with other materials tested, the same amount of protection was secured by 5 gm. of bread as by 2 gm. of brewery yeast, 0.1 gm. of yeast extract, or 5 gm. of mushrooms.

On the nutrient value and the ferment content of 100 years old rice, B. C. P. Jansen (*Meded. Burgerl. Geneesk. Dienst Nederland. Indië, No. 1 (1923), pp. 123-135*).—An examination is reported of the content of proteins, vitamin A, and vitamin B in unhusked rice (paddy) which had been stored for over 100 years in the dry atmosphere of the plateau of Korinchi, Sumatra.

As judged by feeding experiments with pigeons and rats in the tests for vitamins B and A and for protein and by metabolism experiments on man for the digestibility of the proteins, no change in nutritive value had taken place in the rice during the long period of storage. The rice was also found to contain the enzyms protease, lipase, and amylase.

Preserving the high vitamin potency of cod liver oils, A. D. Holmes (*Amer. Food Jour., 19 (1924), No. 2, pp. 55, 56, 85, figs. 3*).—This is a general discussion of the methods employed in the manufacture of cod liver oil and of the author's technique in studying the potency of cod liver oil as a source of antirachitic vitamin (E. S. R., 50, p. 664).

A critical investigation and an application of the rat-growth method for the study of vitamin B, H. C. Sherman and A. Spohn (*Jour. Amer. Chem. Soc., 45 (1923), No. 11, pp. 2719-2728, figs. 2*).—In the work reported in this paper, the rat-growth method was subjected to a critical examination as to its value for the quantitative study of vitamin B. Details are reported on the selection and care of the experimental animals and on the methods employed for preparing and testing basal diets free from vitamin B. Two basal diets which have been found to furnish practically optimum proportions of all the nutrients required by rats except vitamin B and to be devoid of this vitamin are described. The first consists of casein extracted in the cold with 60 per cent alcohol 18, salt mixture (Osborne and Mendel) 4, butterfat 10, and cornstarch 68 per cent. The second differs from this in the substitution of 2 per cent of cod liver oil for its equivalent in butterfat.

Preliminary to the study of the heat destruction of vitamin B, a series of experiments was conducted using the basal diets with varying amounts of the milk powder. With both diets the largest difference in weight gained from the same difference in milk fed was that between 6 and 8 cc. of fluid milk. Consequently 0.8 gm. of dry or 8 cc. of reconsrtucted milk was used when the milk was fed separately from the basal ration. When the skim milk powder was mixed with the basal diet 25 per cent was used. The experiments were in all cases begun at weaning and continued for eight weeks. At least 10 animals were used for each test. The results obtained in the study of the heat destruction of vitamin B are summarized as follows:

"There was no evidence of any measurable diminution of vitamin B in milk powder heated dry with free access of air at 100° even when this heating was continued for 48 hours. When the milk was heated in the fluid state for 6 hours at 100° there was an apparent diminution in its vitamin B content; probably about one-fourth of the vitamin was thus destroyed. Vitamin B in the form in which it exists in milk is, therefore, comparatively stable to heating at 100° in the dry state, but less stable when heated at the same temperature in water solution."

Anatomical investigations on the question of accessory foodstuffs [trans. title], A. MEYERSTEIN (*Arch. Path. Anat. u. Physiol.* [*Virchow*], *239* (*1922*), *No. 2*, *pp. 350–362*, *figs. 6*).—The author reports an examination of the various organs of 12 of the rats used in the vitamin studies of Gralka and Aron previously noted (E. S. R., 47, p. 466). Of particular interest are drawings and microphotographs of the cell structure of the testicles and ovaries of rats on diets rich and poor in vitamin A. The sexual organs of animals on the deficient diet were poorly developed and showed failure of normal maturation and an increase in interstitial tissue.

The occurrence of gastric lesions in rats, and their possible relation to dietary deficiency, A. M. PAPPENHEIMER and L. D. LARIMORE (*Soc. Expt. Biol. and Med. Proc.*, *21* (*1923*), *No. 3*, *pp. 141, 142*).—Attention is briefly called to the frequent occurrence of lesions in the rumen or esophageal portion of the stomach of rats on various experimental diets. The lesions are described as consisting of "an inflammatory edema of the mucosa and submucosa, with marked cellular reaction and in most cases localized ulcerations. Associated with these inflammatory changes there was always present more or less epithelial hyperplasia. These lesions were situated by preference near the elevated ridge which divides the rumen from the glandular portion of the rat's stomach."

A tabulation of the diets used and the extent of the lesions described showed entire absence of the lesions in 43 animals on a complete diet, while of 36 on various deficient diets, lesions were present in 20 cases. While the exact nature of the deficiency has not been determined, the fact that the lesions were present in 7 out of 14 animals on a diet deficient only in vitamin A and were absent in 6 animals fed the same diet with the addition of cod liver oil indicates that deficiency in vitamin A is an important factor.

Fat metabolism in avitaminosis, IV, V [trans. title], K. ASADA (*Biochem. Ztschr.*, *143* (*1923*), *No. 3–4*, *pp. 387–398*, *figs. 4*; *144* (*1924*), *No. 3–4*, *pp. 203–211*, *figs. 6*).—Continuing the investigation previously noted (E. S. R., 50, p. 860), two papers are presented.

IV. *The metabolism of avitaminous rats during fasting, during digestion, and following the injection of adrenalin.*—This paper reports determinations of the gaseous metabolism of normal rats during fasting and during the digestion and absorption of a test meal of vitamin-free lard. The animals were then fed a vitamin-free diet and the metabolism again determined during the course of avitaminosis, both in the fasting state and following the feeding of the test meal. Finally the animals were fed a vitamin-rich diet and the experiment repeated.

The results obtained indicated that during the hypo- and avitaminous stages the gaseous metabolism sinks lower and lower not only during fasting, but also following the ingestion of food.

V. *The distribution of fats and lipoids in the liver following phosphorus poisoning in normal, fasting, and avitaminous animals.*—This paper supplements the third of the series by the microscopic examination of the livers of rats under the same conditions as noted in the earlier paper. Colored plates are included, showing the staining of the neutral fat with Sudan III and of the cholesterol with iodin.

These microscopic findings confirmed in general the chemical findings previously reported. Aside from the structural alterations in the protoplasm and nuclei of the liver cells resulting from avitaminosis, the phosphorus-poisoned avitaminous liver showed the same microscopic picture as the phosphorus-poisoned liver from animals on a vitamin-rich diet, but the cholesterol content of the former was higher than of the latter.

On the need of antiberiberi vitamin of the animal organism and on the amount of this vitamin in different foodstuffs, B. C. P. Jansen (*Meded. Burgerl. Geneesk. Dienst Nederland. Indië, No. 1 (1923), pp. 1–122, pl. 1*).—The plan adopted in this extensive study of the content of antineuritic vitamin in foods commonly used in the Dutch East Indies was to feed pigeons kept in separate cages 15 or 20 gm. daily of a mixture of washed polished rice with various amounts of the food being tested, this being previously dried. If on the following morning some of the food remained uneaten, it was forcibly fed before the day's ration was given. In the case of foods containing very little antineuritic vitamin, a definite amount of katjang idjo, a native bean rich in this vitamin, was added to the material in definite amounts. At least 3 and sometimes as many as 8 or 9 pigeons were used for testing a given amount of each food, and the experiments were continued for three months, unless symptoms of polyneuritis occurred earlier. As the result of this investigation and previously reported work of others, the author classifies foodstuffs with respect to their content of antineuritic vitamin as follows:

(1) Foodstuffs with a very high vitamin content, sufficient to compensate at least twice their weight of boiled polished rice, the whole being calculated on the dry basis; (2) those which contain sufficient vitamin for their own metabolism, but not enough to make up for the vitamin shortage of more than an equal amount of boiled polished rice; (3) those with a deficiency of antineuritic vitamin; and (4) those whose vitamin content has not been determined completely, but which do not protect from beriberi when given in quantities much larger than customarily used. Among the materials thus classified are the following: (1) Bran and in general the germ and pericarp of cereals, eggs including salted eggs, meat, and especially such organs as heart, brain, and liver, katjang idjo, peanuts, and peanut press cake; (2) maize, unpolished rice, and unpolished or only superficially polished grains of cereals, milk, boiled potatoes, boiled sweet potatoes, the fruit of coconuts freed from their oil at low temperature, and soy beans; (3) white bread, maize meal, dried shrimps,

bananas, commercial coconut press cake, and cassava meal; and (4) dried fish, spinach, French beans, kangkong leaves, nangka fruits, and kemiri nuts.

Laryngeal symptoms in beriberi, A. S. Fernando (*Philippine Jour. Sci., 24 (1924), No. 1, pp. 41–43*).—Reports are given of two cases of the cardiac type of beriberi involving paralysis of the vocal cords. Attention is called to the frequent observations of hoarseness and loss of voice in connection with beriberi. It is suggested that this laryngeal symptom may be secondary to changes in the nerves supplying the laryngeal muscles.

Experimental production of rickets with diets of purified food substances, T. B. Osborne, L. B. Mendel, and E. A. Park (*Soc. Expt. Biol. and Med. Proc., 21 (1923), No. 2, pp. 87–90*).—The authors criticize many of the investigations which have been conducted on the dietary factors involved in rickets on the ground that it has been difficult to point to one factor alone to which the production of the disease may be attributed. A diet which is thought to overcome these objections and which can be modified by removing one factor at a time consists in general of purified protein, starch, salt mixture, and Osborne and Wakeman yeast fraction in small quantities as a source of vitamin B. The complete salt mixture recommended consists of $CaCO_3$ 134.8 gm., $MgCO_3$ 24.2, Na_2CO_3 34.2, K_2CO_3 141.3, H_3PO_4 103.2, HCl 53.4, H_2SO_4 9.2, citric acid $+H_2O$ 111.1, Fe citrate 1½ H_2O 6.34, KI 0.020, $MnSO_4$ 0.079, NaF 0.248, and $K_2Al_2(SO_4)_4$ 0.0245 gm. This may be altered by omitting the calcium, magnesium, or phosphorus as desired. The phosphorus-free mixture recommended has the following composition: $CaCO_3$ 122.4 gm., $MgCO_3$ 12.1, Na_2CO_3 17.1, K_2CO_3 35.3. HCl 53.4, H_2SO_4 9.2, citric acid H_2O 95.0, Fe citrate 1½ H_2O 6.34, KI 0.020, $MnSO_4$ 0.079, NaF 0.248, and $K_2Al_2(SO_4)_4$ 0.0245 gm. It is stated that marked rickets has been produced in young rats on diets consisting of purified protein (edestin or lactalbumin) from 16 to 20 per cent, starch from 56 to 52 per cent, lard from 0 to 24 per cent, and phosphorus-free salt mixture 4 per cent, with a daily addition of 40 mg. of yeast fraction.

Hydrochloric acid therapy in rickets, M. R. Jones (*Jour. Amer. Med. Assoc., 82 (1924), No. 6, pp. 439, 440, figs. 2*).—The possibility is suggested that some cases of rickets may be due to a deficiency of hydrochloric acid in the gastric secretion or an excess of alkali in the intestinal juices. The evidence advanced in support of this hypothesis is the production of rickets in young puppies on a diet apparently adequate in protein, fat, carbohydrate, salts, and vitamins, but possessing a high potential alkalinity, and in the cure of a few cases of rickets in children by no change in the diet other than the addition of hydrochloric acid.

ANIMAL PRODUCTION.

The application of the indirect method of calorimetry to ruminants, J. B. Orr and H. E. Magee (*Jour. Agr. Sci. [England], 13 (1923), No. 4, pp. 447–461, figs. 5*).—The principles of indirect calorimetry are reviewed, and the Haldane apparatus for analyzing the air is more briefly described than by Cathcart (E. S. R., 41, p. 172). When applying the method of indirect calorimetry to ruminants, two main difficulties are encountered, i. e., the collection of the expired air and the presence of the gases of fermentation in the expired air. The use of a mask is recommended for determining the amount of air expired and for collecting samples for analysis. The CO_2 present is determined by the change in volume of the air after passing it over KOH. The combustible gases are oxidized by passing an electric current through a platinum wire, and the CO_2 thus formed is similarly determined. The amount of methane present is calculated as one-third the amount of CO_2 produced.

The oxidation of hydrogen would reduce the volume of the air, but produce no CO_2. After estimating the carbon dioxid resulting from the metabolism of the tissues and that from the combustion of methane, the gas was passed over alkaline pyrogallate solution for absorption of the oxygen.

Determinations of the temperature and barometric pressure at the time of measuring the expired air must also be made. The methods of calculating the CH_4 and CO_2 produced by fermentation, the O_2 consumed, and CO_2 produced in tissue metabolism, and the heat produced by fermentation and metabolism, are described.

Calorimetry experiments with goats at the Rowett Research Institute have shown considerable differences to occur in the same animal under seemingly identical conditions, due to changes in the muscular activity which may not be otherwise evident. Increases of about 12 per cent in the metabolism were observed while standing as compared with lying. The metabolism was also much greater after eating. Experiments so far have indicated that methane is the only combustible gas produced through fermentation, and that the amount apparently depends on the food eaten even during several previous days.

The effect of sodium hydroxid on the composition, digestibility, and feeding value of grain hulls and other fibrous material, J. G. Archibald (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 5, pp. 245–265*).—This is a more detailed report than was previously noted from the Massachusetts Experiment Station (E. S. R., 49, p. 167) dealing with the effect on the digestibility of the treatment of oat, barley, rice, and cottonseed hulls and flax shives with sodium hydroxid by the Beckmann process.

All hulls were treated for 3 hours with 8 times their weight of a 1.5 per cent solution of NaOH. One per cent solutions were also used for oat and barley hulls and a 3 per cent solution for rice hulls. After treatment, the materials were washed with water and then dried. During the treatment and washing process the soluble constituents were largely removed. From the summary in the table below of the changes in composition occuring, it will be noticed that the greatest actual loss of nutrients was in the nitrogen-free extract, this being ascribed to the especially heavy losses of pentosans and lignin. The losses of proteins and fats were proportionately large, but the amounts of each in the hulls were small.

Changes in the composition of hulls by the action of sodium hydroxid.

Hulls treated.	Strength of NaOH.	Loss in weight by treatment (dry matter basis).	Loss of nutrients per 100 pounds of dry matter treated.					
			Dry matter.	Crude protein.	Crude fat.	Crude fiber.	N-free extract.	Ash.
	Per cent.	*Per cent.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Oat	1.5	16.54	16.55	1.12	0.47	[1] 0.31	13.30	1.97
Oat	1.0	10.74	10.75	.43	.51	2.18	6.37	1.26
Barley	1.5	20.29	20.29	3.44	.68	.39	14.73	1.05
Barley	1.0	19.31	19.31	2.41	.66	.25	15.31	.68
Rice	1.5	15.60	15.57	.90	.26	2.91	7.18	4.32
Rice	3.0	19.51	19.53	1.55	.31	1.35	7.83	8.49
Cottonseed	1.5	9.69	9.68	1.34	.43	[1] 1.01	9.27	[1] .25
Flax	1.5	25.08	25.08	1.98	.81	6.70	15.51	.08

[1] Represents gain.

The digestibility of the hulls both before and after the treatment was determined in combination with a basal ration of English hay and salt, with and without gluten feed, using two wethers as the experimental animals. The total dry matter, crude fiber, nitrogen-free extract, pentosans, and lignin, being the most important constituents in the hulls, are the only nutrients on which the coefficients of digestibility are reported, a summary of the average determinations for which follows:

Average coefficients of digestibility of nutrients in treated and untreated hulls.

Feed.	Treatment.	Coefficient of digestibility.				
		Total dry matter.	Crude fiber.	N-free extract.	Pentosans.	Lignin.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Oat hulls	Untreated	36.24	52.57	34.08	35.91	----------
Do	1 per cent NaOH[1]	70.37	82.77	64.67	71.07	39.63
Do	1.5 per cent NaOH	80.61	91.07	79.04	73.78	37.36
Barley hulls	Untreated	59.97	44.79	59.85	47.40	----------
Do	1 per cent NaOH	68.69	52.28	74.81	64.89	34.70
Do	1.5 per cent NaOH	82.50	81.28	84.60	83.04	----------
Rice hulls	Untreated	----------	----------	9.89	----------	----------
Do	1.5 per cent NaOH	29.16	28.48	38.04	55.92	15.97
Do	3 per cent NaOH	33.99	25.57	45.05	39.09	16.35
Cottonseed hulls	Untreated	53.02	58.21	58.70	90.18	----------
Do	1.5 per cent NaOH	54.52	52.56	67.69	100.78	----------
Flax shives	Untreated[1]	30.15	18.67	33.18	25.36	27.79
Do	1.5 per cent NaOH	28.76	22.76	38.38	42.71	----------

[1] One sheep.

The results obtained indicated that the 1.5 per cent NaOH solution was much more efficient in increasing the digestibility than the 1 per cent solution and practically equal to the 3 per cent solution. The digestibility of oat hulls and barley hulls was markedly increased by the treatment, the feeding value of oat hulls being practically doubled. The author states that the treatment of cottonseed hulls, flax shives, and rice hulls was not productive of such promising results, however.

Silage investigations—loss of nutrients in the silo and during the field curing of corn, A. C. RAGSDALE and C. W. TURNER (*Missouri Sta. Research Bul. 65 (1924), pp. 3–10*).—The losses of dry matter and nutrients in corn and other silage preserved in small experimental silos used in earlier studies at this station (E. S. R., 41, p. 334) are summarized in the following table and compared with the losses occurring in shock corn:

Loss of nutrients in the production of silage and field curing of corn.

Kind of silage	Silos.	Gain or loss of nutrients.					
		Dry matter.	Protein.	Fat.	Crude fiber.	N-free extract.	Ash.
	No.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Normal corn silage	20	−4.01	+4.06	+24.96	+6.66	−10.01	+11.44
Shock corn silage	13	−9.95	−12.48	+6.14	−6.07	−13.03	+11.69
Grass crops[1] silage	6	−18.06	−38.40	−20.26	−14.58	−17.79	−15.72
Peas and oats silage	4	−6.90	−12.07	+49.37	−10.48	−6.68	−7.41
Legume crop silage	9	−2.12	+5.11	+85.02	+3.85	−5.73	+7.98
Shock corn, field cured	[2] 16	−15.12	−.84	+7.36	+3.82	−22.51	−9.30

[1] Includes 2 rye, 1 wheat, 2 Sudan grass, and 1 sunflower.
[2] Shocks.

The results of the experiments show that losses of nutrients are inevitable in silage, but the extent of the losses is much less than in field-cured corn provided the silage is properly made.

Fourth annual report [of the] division of feed inspection for the year 1922, H. A. Halvorson (*Minn. State Dairy and Food Comn., Div. Feed Insp. Ann. Rpt., 4 (1922), pp. 187, figs. 3*).—The guaranties, analyses, and ingredients of the samples of feeding stuffs officially inspected in Minnesota during 1922 are given, as well as other general information on feeds and feed regulations and the results of an investigation of the effect of fineness of grinding on the fat and crude fiber analyses of feeds, by R. F. Korfhage, abstracted on page —. The previous report was noted (E. S. R., 48, p. 68).

Commercial cuts of meat, W. C. Davis (*U. S. Dept. Agr., Dept. Circ. 300 (1924), pp. 9, pls. 4*).—Brief descriptions are given of the Chicago methods of cutting beef, veal, lamb, and pork carcasses, with data as to the percentage yields of the various cuts and an appeal for greater uniformity in the methods of cutting meat.

The utilization of feed by range steers of different ages, M. G. Snell (*New Mexico Sta. Bul. 140 (1923), pp. 7*).—This is a popular review of the results of the experiments previously noted (E. S. R., 32, p. 467; 36, p. 470; 49, p. 868).

Bone chewing by cattle, H. Welch (*Montana Sta. Circ. 122 (1924), pp. 8, figs. 2*).—Bone chewing in cattle is discussed as due to a deficiency in the lime supplied by the ration. Wild grasses, timothy, and straws are usually especially low in lime, though they may vary with the soil. When such feeds are supplied, additional minerals in the form of bone meal, bone ash, or bone charcoal, or some other source of calcium phosphate should be available.

[Sheep breeding at the Middle Tennessee Station], C. A. Willson (*Tennessee Sta. Rpt. 1921, pp. 10, 11*).—One hundred and ten common ewes, purchased in July, 1920, were divided into four lots and the different lots bred to Southdown, Shropshire, Hampshire, and Oxford rams. The ewes showing some blood of the dark-faced Down breeds produced an average of 1.52 lambs, weighing 95.2 lbs. at market age, as compared with 1.24 lambs weighing 62.7 lbs. produced by the white-faced ewes. The dark-faced ewes and those in fair to good condition raised larger percentages of twins. The average birth weights of the lambs did not seem to be affected by the sires, but the gains made by the lambs were proportional to the weights of their sires. The percentages grading as fancy sired by rams of each breed were Southdown 69, Shropshire and Hampshire 64 each, and Oxford 47 per cent.

Introduction of sheep into New Zealand, J. G. Cook (*New Zeal. Jour. Agr., 28 (1924), No. 3, pp. 161–163*).—A compilation of the dates of first introducing the different breeds of sheep into New Zealand has been prepared.

The influence of cod-liver oil, linseed oil, and olive oil on the assimilation of calcium and phosphorus in the growing pig, A. D. Husband, W. Godden, and M. B. Richards (*Biochem. Jour., 17 (1923), No. 6, pp. 707–719, figs. 3*).—The results of three experiments conducted at the Rowett Research Institute to study the action of oil in the ration on calcium and phosphorus assimilation in pigs are reported. The basal ration fed to each of the three 2 to 4 months old pigs used in each experiment consisted of corn meal, middlings, oatmeal, and blood meal, 10:10:10:1, plus 50 cc. of a 20 per cent calcium chlorid solution daily. The basal ration was very low in calcium, containing only 0.061 per cent CaO. In each experiment the pigs were fed for at least 6 days in metabolism crates until they became accustomed to the routine of having the feces and urine production and the food consumption determined.

Analyses for N, CaO, and P_2O_5 were made for each. From 30 to 40 cc. per day of cod liver oil, linseed oil, or olive oil were each supplied to one of the pigs in each of the three experiments. The pig in the third experiment receiving olive oil was also given 26 gm. of chalk, plus 5 gm. of sodium chlorid, per day in place of the calcium chlorid solution. This mineral mixture was later modified by the substitution of 8 gm. of $Ca_3(PO_4)_2$ for 6 gm. of the chalk.

The results of the experiments, which are tabulated in detail, indicate that the addition of any of the three oils to the grain ration increased the assimilation of both calcium and phosphorus. Both cod liver oil and olive oil, when given to pigs showing negative calcium balances, acted more rapidly than linseed oil in changing them to positive balances, but when the calcium balances were positive the addition of any of the oils produced equal increases in the calcium retained. Phosphorus assimilation followed the same general course as calcium assimilation. Assimilation of both seemed to be largely influenced by the action of the oils rather than by the action of vitamin A.

[Hog feeding experiments at the Canadian Department of Agriculture], G. B. ROTHWELL (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1922, pp. 27–46, fig. 1*).—The following experiments were conducted during 1922 and 1923:

Pasturing hogs.—Three lots of Yorkshire pigs averaging 92, 75, and 65 lbs. in the different lots and receiving grain rations plus skim milk were placed on oat, barley, and sweet clover pastures for 40, 62, and 58 days, respectively, during which time they made average daily gains of 1.03, 1.26, and 0.84 lbs. per pig. Another lot of 9 Berkshires averaging 50 lbs. in weight made average daily gains of 0.87 lb. during 58 days on Japanese millet pasture. It was found that the Japanese millet was the most persistent grower and had the greatest carrying capacity, and that the grain and milk consumption were smallest in the lot on this pasture.

Bacon hog feeding test.—Six pairs of Yorkshires, three pairs of Berkshires, and three pairs of Tamworths raised by different breeders were compared as to their ability to produce Wiltshire sides. The pigs, which varied from 50 to 125 lbs. in weight at the start of the test, were finished in from 107 to 162 days and slaughtered. The average scores of the carcasses of the different breeds were Yorkshire 92.2, Tamworth 89.7, and Berkshire 86.9 points.

Home mixed v. commercial feed.—One lot of three hogs averaging 45 lbs. per head made daily gains of 1.25 lbs. on a home-mixed ration of barley, oats, shorts, middlings, oil meal, and tankage, while another lot of four 63.7-lb. hogs made average daily gains of 1.38 lbs. when self-fed Motherwell's Staminax Milk Hog Feed. The calculated cost per pound of gain was less than half on the home-mixed ration.

Ground hull-less oats v. ground oats.—Four pigs averaging 202 lbs. in weight receiving ground hull-less oats in a ration of barley, shorts, middlings, oil meal, and tankage made average gains of 1.22 lbs., while another lot of three pigs averaging 185 lbs. made average daily gains of 1.25 lbs. on a ration in which ground oats was substituted for hull-less oats. The gains were more economically made by the lot receiving ground oats.

Milk substitute experiment.—Three lots of hogs averaging 135, 247, and 295 lbs. received grain fed as a slop in skim milk, Pro-lac (a buttermilk or skim milk substitute) and in water, respectively. The average daily gains made by the three lots were 1.25, 0.9, and 0.63 lbs., respectively.

Comparison of corn v. barley.—Corn and barley were compared as components of a grain mixture of oats, bran, shorts, oil meal, and tankage in a 90-day experiment using two lots of Berkshire and two of Yorkshire pigs. During the first 30 days barley and corn made up a third of the ration, and the gains were considerably greater when corn was fed, with both breeds. In the second period the rations consisted of 50 per cent corn or barley, and in the case of the Yorkshires the gains were slightly greater on the barley ration, whereas with the Berkshires the reverse was true. The Yorkshires only were continued during the third 30-day period when the rations consisted of 60 per cent corn or barley. The average daily gains were 1.56 and 1.5 lbs., respectively. The results of the experiment indicated that barley compared favorably with corn, the gains being produced more economically but the finish not being quite as good as with corn.

Organic supplements.—Four lots of Yorkshire hogs receiving a grain mixture of oats, barley, shorts, middlings, and oil meal were also given skim milk during 60 days of the test. Organic supplements in the form of tankage, meat meal, and fish meal were also furnished in self-feeders to lots 2, 3, and 4. A fifth lot consisted of Berkshires similarly fed but receiving beef and bone meal in self-feeders. The experiment was continued for a second 30-day period in the same way except that the skim milk was omitted from the ration. Throughout both experiments the pigs were confined to a piggery without yards or runs. At the start of the tests the average weights of the lots varied from 40 to 57 lbs. The average daily gains made during the first 60 days were, respectively, 1.2, 1.23, 1.3, 1.25, and 1.03 lbs. by the lots from 1 to 5. The gains for the second 30-day test were 0.93, 1.29, 0.94, 0.86, and 0.61 lbs. During the first 60 days more grain and skim milk were required per pound of gain when no supplements were furnished, though the most economical gains were made in the lot receiving beef and bone meal.

Of the Yorkshires the meat meal lot made the largest gains and required the smallest amount of feed per unit of gain. The fish meal and tankage-fed lots were very nearly equal and closely followed the meat meal lot. During the second 30-day period gains were reduced in all but the tankage lot, and the amounts of grain required per unit of gain were materially increased, thus indicating the feeding value of skim milk. The tankage group clearly excelled in economy of gain, followed in order by the lots receiving meat meal, no supplement, fish meal, and beef and bone meal.

Pulped roots v. beet pulp for brood sows.—Farrowing results of five Yorkshire sows receiving daily during gestation 5 lbs. of pulped mangels in addition to 5 lbs. of a mixture of oats, bran, shorts, tankage, and bone meal were compared with the farrowing of five similar sows receiving daily rations of 1 lb. of dried beet pulp and 7 lbs. of the same grain mixture. The sows on the beet pulp ration farrowed 53 pigs, of which 90.5 per cent were recorded as good, while the sows on the pulp mangel ration farrowed 63 pigs, of which 82.5 per cent were good. The pigs from the latter sows also averaged 0.2 lb. heavier at birth. These results are in conformity with those of previous experiments.

Stallion enrollment.—XII, Report of stallion enrollment work for the year 1923, with lists of stallions and jacks enrolled (*Indiana Sta. Circ. 116 (1923), pp. 55*).—As in previous reports (E. S. R., 49, p. 273), this consists largely of a directory of enrollments and renewals of stallions and jacks standing for service in Indiana during the calendar year 1923.

The rearing of chickens on the intensive system, III–V, R. H. A. Plimmer, J. L. Rosedale, and W. H. Raymond (*Biochem. Jour., 17 (1923), No. 6, pp. 772–799*).—Three studies are reported in continuation of this series (E. S. R., 48, p. 272).

III. *B-vitamin requirements. Comparison of yeast extracts and dried yeast.*—The results of studies in comparing the vitamin B content of yeast extracts, dried yeast, and certain foodstuffs are reported, using adult pigeons and day-old chicks as the experimental animals. The rations included rice, oatmeal, skim milk, and fish meal, with additions of minerals, cod liver oil, and yeast preparations.

In the first experiment marmite or cerema (a cheaper source of vitamin B) were found to be required in amounts of 3 gm. per 90 gm. of polished rice and 15 gm. of fish meal for the prevention of leg weakness in adult pigeons. In another experiment, 10 of 12 baby chicks died when receiving a ration of rice and dried skim milk, equal parts, with the addition of cerema in amounts starting at 0.75 gm. per 90 gm. of rice and increased to 6 gm. The 2 survivors were raised to maturity by increasing the cerema to 7.5 gm. In a similar experiment in which oatmeal replaced the rice, 5 of 10 chicks were successfully raised from May 4 to August 3 without having to add more than 0.75 gm. of cerema per 90 gm. of oatmeal to the ration. The 5 chicks lost were accidentally killed.

In another experiment using the white rice, dried skim milk diet, two lots of baby chicks were successfully raised to maturity by starting with the addition of 3 gm. of marmite or cerema to 90 gm. of rice and increasing these amounts to 3.75 gm. of marmite and 4.5 gm. of cerema. It was concluded from these results that with this ration 5 gm. of cerema is equal to 3.75 gm. of marmite when fed with 90 gm. of white rice and dried skim milk.

In comparing cerema with dried yeast two lots of 10-day-old chicks were started on December 22 on a ration of white rice 2 parts and dried skim milk 1 part plus 6 gm. of cerema in one lot and an equal amount of dried yeast in the other per 90 gm. of rice. Cod liver oil was also furnished. During the third week of the experiment leg weakness developed in the dried yeast lot, and the amount supplied was doubled. During the fifteenth week the amount of cerema was increased to 6.75 gm. due to the occurrence of leg weakness. Two of the chicks from the cerema lot were lost, one of which was due to accident, and one chick was lost from the yeast lot. The rest were raised to eight weeks of age.

In two further experiments two lots of chicks were raised to maturity (14 and 20 weeks, respectively) on rations of 90 gm. of rice, 5 gm. of fish meal, and 9 gm. of marmite. Varying amounts of cod liver oil from 0.5 cc. to 5 cc. supplemented this mixture. Although the birds were raised, feathering was slow, signs of leg weakness were evident, and sexual development was much retarded, the cocks never crowing. The authors conclude that the excess amounts of cod liver oil produced the signs of leg weakness.

As a result of these tests the relative vitamin B values suggested for the foods compared were marmite 100, cerema 75, dried yeast 50, oatmeal 7.9, and dried skim milk 6.7.

IV. *C-vitamin requirements of chickens and other birds.*—In studying the ability of birds to thrive without vitamin C, chickens were reared from the day-old stage to 14 months of age on a diet of white rice and dried skim milk, supplemented by marmite and cod liver oil. The hens in this group laid eggs, the yolks of which were very white, and some difficulty was experienced with their hatchability, but by increasing the amounts of cod liver oil supplied this trouble was partially remedied. Three chicks were raised to maturity from these eggs. Eggs were also successfully hatched which had been laid by another lot of birds on a vitamin free diet. Interesting observations of the effect on the reproductive functions of hens and cocks when vitamin A was omitted from the ration were also made.

In another experiment two pairs of pigeons were maintained in health without vitamin C for 14 months, during which time they produced fertile eggs from which three perfect birds were raised, though many died under two weeks of age.

Further experiments in which ducks, geese, turkeys, guinea fowl, and pheasants have been raised from the day-old stage to 10 to 16 weeks of age on diets free of vitamin C indicate that domestic birds do not require vitamin C in their rations.

V. *Comparative B-vitamin requirements of pigeons, chickens, and other birds.*—To test the relative requirements of different birds for vitamin B, an unsuccessful effort was made to raise chicks and ducklings on a diet of 90 gm. of oatmeal and 5 gm. of fish meal, which has been found sufficient for the maintenance of normal health in adult pigeons. By gradual additions of marmite to this combination and using the other types of domestic poultry, the minimum requirements for chicks seemed to be 1.5 gm. and for ducks, geese, guinea fowl, turkeys, and pheasants 2.25 gm. to supply sufficient vitamin B for normal growth.

Feeding young chickens in confinement, L. C. Dunn (*Connecticut Storrs Sta. Bul. 116 (1924), pp. 3–16, figs. 4*).—The results of two experiments in raising chicks in confinement are popularly reported. In the first experiment two lots of chicks receiving supplements of 2 per cent cod liver oil and 2 per cent cod liver oil and 0.5 per cent yeast were successfully raised to 9 weeks of age, whereas two other lots not receiving the cod liver oil died before the end of the ninth week with leg weakness. The basal mash fed consisted of equal parts of meat scrap, corn meal, standard middlings, gluten feed, and ground oats plus 1 per cent of calcium carbonate, 0.5 per cent salt, and about an equal amount of bran.

In another experiment, where the cod liver oil was added in amounts of 0.5, 1, and 2 per cent to the mash, the chicks were raised normally, but leg weakness developed in another in which the 1 per cent of cod liver oil added had been previously absorbed by starch and stored for six months. The conclusions from this and other work of similar nature indicate that the difficulties of raising chicks in confinement are due to vitamin, mineral, and roughage deficiencies and a lack of proper exercise and sunlight. The addition of 0.5 per cent of suitable cod liver oil to the rations of chicks is recommended.

Home-grown protective poultry feeds, Mrs. G. R. Shoup (*Western Washington Sta. Bimo. Bul., 12 (1924), No. 1, pp. 7–9*).—Suggestions are given for supplying necessary green feeds to chickens.

Turkey raising, M. A. Jull and A. R. Lee (*U. S. Dept. Agr., Farmers' Bul. 1409 (1924), pp. II+22, figs. 15*).—This is a revision of and supersedes Farmers' Bulletin 791 (E. S. R., 36, p. 871).

DAIRY FARMING—DAIRYING.

Studies in the growth and nutrition of dairy calves.—VIII, Raising dairy heifers by means of the self-feeder, A. C. McCandlish (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 572–587, figs. 3*).—In continuing this series of studies (E. S. R., 50, p. 579), the records are given of the gains in weight and body measurements and the feed consumption of three heifer calves of the Holstein, Ayrshire, and Jersey breeds raised from about 1 to 23 months of age on self-feeders.

From the first to the eighth periods, inclusive, the calves received whole milk hand-fed with access to alfalfa hay, shelled and cracked corn, whole and ground oats, wheat bran, linseed oil meal, and salt, which were also fed throughout the entire test. The calves were placed on pasture from the ninth to the fourteenth periods during which time no alfalfa hay was fed. From the fifteenth to the eighteenth periods corn silage as well as alfalfa hay was given, and the grain was discontinued at the end of the eighteenth period, with a return to pasture and a discontinuance of all feed at the end of the twentieth period.

The heifers made excellent gains both in body weight and measurements as compared with the normal throughout the test. The total consumption of feed by the three heifers, indicating the relative palatibility and desirability of each feed, was 4,840 lbs. whole milk, 2,487 skim milk, 5,823 whole corn, 6,411 cracked corn, 1,842 whole oats, 197 ground oats, 418 wheat bran, 874 oil meal, 2,574 alfalfa hay, 3,508 corn silage, and 15.58 lbs. salt.

The initial consumption of large amounts of whole corn while milk was being fed, with gradual decreases accompanied by increases in the cracked corn consumption after the milk feeding ceased, are interesting observations which were made. The greater portion of the whole oats was consumed after the fourteenth period.

Feed costs were calculated and found to be lower per pound of gain with self-feeders, but the extra conditioning tended to delay breeding. Two of the heifers freshened at 25 and 27 months of age, whereas the third heifer was gotten with calf only after lowering her condition, and she was due to freshen at 32 months of age.

A study in herd expansion, J. J. Hooper and N. Lawrence (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 588–590*).—This is a brief summary of the development of a herd which was started in 1896 with 14 cows and was still in operation in 1922. A special study of a 5-year period deals with the cows bred which calved and the number and proportion of heifers properly developed during this period for retention in the herd.

How the advance of the period of lactation affects the milk flow, C. W. Turner, A. C. Ragsdale, and S. Brody (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 527–531, fig. 1*).—The daily milk records of 80 Holstein-Friesian cows in the University of Missouri herd indicated that the maximum production was reached in 15–16, 18, and 28 days after calving by cows milked 2, 3, and 4 times a day, respectively.

A study of the monthly rates of decline in milk production by Guernsey cows indicated that after the second month of a lactation each succeeding month's production is about 94 per cent of the preceding month's production, provided the cows are not pregnant. In case of pregnancy there is a larger decrease during the last two or three months of the lactation period.

A test for determining the character of the curd from cows' milk and its application to the study of curd variance as an index to the food value of milk for infants, R. L. Hill (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 509–526, figs. 11*).—A method for testing the strength of the curd of milk is described which depends on the force as registered by a spring balance required to draw a specially designed curd knife through a sample of milk which has been allowed to stand 10 minutes in a water bath at 35° C. (95° F.) after the addition of 10 per cent of a pepsin-calcium chlorid mixture.

The results of tests of the curd strength of Jersey and Holstein milk indicated that the Jersey curd was usually harder than the curd of Holstein milk, though occasionally individual exceptions occurred. The period of lactation also affects the hardness of the curd, as during the first half of lactation it is greatly increased with gradual decreases in hardness during the last half.

In the test to determine the effect of fat on the curd strength, skim milk was found to have a higher tension than the whole milk from which it was obtained. This, together with other results, made it evident that there was no relation between the curd strength and the fat content except that the presence of fat tends to soften the curd. The principal value of the test as designed is for selecting milk having a soft curd for infant feeding, and some previously unexplained results in feeding different milks to infants might be accounted for on the basis of this test.

The problem of transporting milk in hot condition, S. H. Ayers and W. T. Johnson, jr. (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 608–615*).—The results are recorded of a study carried on at the Dairy Division, U. S. D. A., designed to determine the feasibility of the use of heat to prevent bacterial growth and undesirable changes in milk during transportation.

The milk was heated in the laboratory to temperatures of 50 to 60° C. (122 to 140° F.) and held for periods of from 4 to 24 hours in a water-bath with sufficient stirring to keep the melted butterfat from rising. It was found that the milk can not be kept at these temperatures for 24 hours without sufficient growth of thermophilic bacteria to usually produce at 50° a rennet curd and some acidity or a strong bitter taste due to proteolysis. At 60° acid formation with coagulation after 24 hours' holding was experienced. Two types of organisms were isolated which seemed to grow at these high temperatures, the one being a spore-forming peptonizer growing best at 40–50°, and the other being a weak acid-producing bacilli growing best at 50–60° and resembling *Lactobacillus thermophilus.*

A study of the effect of long heating on the cream layer indicated that 50 to 55° for 6 hours had no effect, but that with 24 hours' heating or higher temperatures the cream layer was materially reduced.

The wide distribution of ropy milk organisms in city milk supplies, A. R. Ward (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 616–623*).—The prevalence of ropy milk organisms about milk plants is discussed, and the results of tests of the milk of 307 patrons delivering at three milk plants showed that 18 per cent devoleped ropiness. In making these tests a pint bottle sample was taken from each patron and held at from 40 to 45° F. for four days.

In a study of the different processes in the milk plant with respect to their relation to the entrance of the ropy milk organism into the milk, it was found that 36 of 40 samples of raw milk, 9 of the 32 samples started to be heated in the pasteurizer, none of 24 samples after pasteurization, 6 of 35 samples from the cooler, and 18 of 44 samples from the bottler developed ropiness.

Tests of the utensils and of materials about the plants showed that the organism was almost universally present in some plants and on practically all utensils which had not been thoroughly scalded.

The value of milk inspection for a small city, E. H. Parfitt (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 569–571*).—The improvement through the work of a milk inspector in the bacterial content of the milk sold in La Fayette, Ind., is reviewed.

Instruction in dairy operations, A. Peter (*Milchwirtschaftliche Betriebslehre. Berlin: Paul Parey, 1923, 2. ed., rev. and enl., pp. XV+278, figs. 6*).—This book deals with the fundamental principles of the production and handling of milk and the manufacture of butter and cheese. Portions of the book also deal with the economic side of dairying.

Cheese making in Georgia, L. H. Marlatt (*Ga. Agr. Col. Bul. 292 (1923), pp. 28, figs. 18*).—The method of manufacturing Cheddar cheese is clearly described.

Sweetened condensed milk.—I, Bacterial thickening, F. E. Rice and P. A. Downs (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 532–548*).—The results of a study of the bacterial changes causing thickening and the development of abnormal flavors and odors in sweetened condensed milk are reported from the New York Cornell Experiment Station. The bacteria present were usually cocci, which originate somewhere in the manufacturing plants. These organisms were found to increase markedly the acidity of the product, with the production of solidification in some cases and a strong fruity odor.

In one experiment, 44 samples of milk were prepared containing ratios of sucrose and water, called the sugar ratio, varying from 52.2 to 63 per cent of sucrose. These samples were inoculated with organisms from thickened condensed milk, and during 35 days' incubation at 30° C. growth occurred in all samples containing a sugar ratio of less than 61.5 per cent, but in very few samples containing more than this amount of sucrose. The amounts of milk solids present did not seem to influence the occurrence of growth. In another like experiment similar results were obtained, except that weak cultures were used which had been kept in the laboratory for some time and the effects of the growth were not as pronounced.

In a further experiment cultures, invigorated by frequent transfers in bouillon, were found to grow in milk containing high concentrations of sucrose as determined by the formation of acid, though thickening of such samples did not occur. In a fourth experiment in which invigorated cultures were used, like results were also obtained.

The results of the four experiments indicated that the minimum concentration of sucrose at which growth did not occur was slightly variable, as also were the effects of the growth on the products containing the higher percentages of sugar.

The effect of the incubation temperature was studied in another experiment in which it was found that less vigorous growth was made at 20° than at 30°. No growth was made on milk containing as high sugar concentrations at 20° as at 30°.

Chemical tests indicated that the organisms acting in the sweetened condensed milk tend to reduce the amount of sucrose, which is accompanied by an apparent increase in lactose. For safety in manufacturing sweetened condensed milk, it is recommended that it contain a sugar ratio of at least 63.5 per cent. Such a product would not be absolutely safe, but it would not be liable to solidify.

The acidity phase of the ice cream mix, B. I. Masurovsky (*Jour. Dairy Sci., 6 (1923), No. 6, pp. 591–607, figs. 3*).—A more detailed account of the results of the investigation previously noted (E. S. R., 50, p. 281).

Statistics of dairy factories, 1922, R. H. Coats (*Canada Bur. Statis., Dairy Factories, 1922, pp. XVI+68*).—Data are tabulated as to the amounts and values of milk and cream received and the dairy products manufactured by the factories of Canada during 1922, with comparisons. Other miscellaneous information deals with the capital invested and employees of the dairy factories and the exports and imports of dairy products.

VETERINARY MEDICINE.

Report on the operations of the veterinary sanitary service of Paris and the Department of the Seine during the year 1922 [trans. title], H. Martel (*Serv. Vét. Sanit. Paris et Dépt. Seine, Rap. Opér., 1922, pp. 239, pls. 8, figs. 25*).—This is the usual annual report (E. S. R., 48, p. 480).

Annual report of the Bengal Veterinary College and of the Civil Veterinary Department, Bengal, for the year 1922–23, A. D. MacGregor and P. J. Kerr (*Bengal Vet. Col. and Civ. Vet. Dept. Ann. Rpt. 1922–23, pp. 5+II+8+IX+3*).—This is the usual annual report (E. S. R., 48, p. 579).

The woolly-pod milkweed (Asclepias eriocarpa) as a poisonous plant, C. D. Marsh and A. B. Clawson (*U. S. Dept. Agr. Bul. 1212 (1924), pp. 14, figs. 7*).—This is a report of feeding experiments carried on with *A. eriocarpa*, a plant growing abundantly in parts of western California, which has been suspected of having been connected with the losses of sheep suffered by California stockmen. The results obtained have shown the species to be very poisonous, not only to sheep but also to cattle. It is pointed out that while animals are not likely to eat it except when other forage is scarce, it is dangerous because of its marked toxic character, since as little as 0.1 lb. per hundredweight of animal may poison, and 0.22 lb. may cause death.

Molds in silage and their significance in the production of disease among livestock, C. H. Eckles, C. P. Fitch, and J. L. Seal (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 6, pp. 716–722*).—The authors recommend the discarding of badly molded silage, but point out that the feeder need not hesitate to utilize silage which contains some mold, especially when fed to cattle.

The physiological action of dyes, G. W. Clough (*Vet. Jour., 80 (1924), No. 586, pp. 147–153*).—The author discusses the relation between the chemical constitution of dyes and their physiological action and toxicity.

A contribution to the knowledge of anaplasmosis [trans. title], Helm (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 25 (1924), No. 4, pp. 199–226, pl. 1, figs. 2*).—The author finds that anaplasmosis can be transmitted to healthy animals through the intravenous injection of blood containing Anaplasma. The paper includes 47 references to the literature.

Report of the advisory committee on anthrax, W. Middlebrook et al. (*Geneva: Internatl. Labor Off., 1923, pp. 86*).—This is the report of the advisory committee on anthrax adopted at their final sitting, held December 14, 1922, as a true historical statement of the work accomplished. Part 1 includes the report of the committee (pp. 5–13) and appendixes consisting of (1) the minutes of the advisory committee on anthrax (pp. 15–67) and (2) a memorandum circulated by the chairman for the information of the members of the committee (pp. 69–74), and part 2 of a minute of dissent communicated by the representative of the Indian Government (pp. 83–86).

Botryomycosis in man and other animals, J. Toblais (*La Botryomycose chez l'Homme et chez les Animaux. Paris: Libr. Octave Doin, 1922, pp. [2]+120, pls. 7, figs. 5*).—This contribution to the study of the granulomas and their treatment includes a bibliography of 18 pages.

Some remarks on the urgency and importance of precautionary measures against infection by animals, persons, and things in suspected foot-and-mouth disease, A. H. Berry (*Vet. Jour., 80 (1924), No. 586, pp. 158–164*).—The author emphasizes the importance of precautionary measures in combating this disease.

Appraisal of diseased animals, W. M. Regan (*Calif. Countryman, 10 (1924), No. 4, pp. 11, 24, fig. 1*).—A brief discussion of this subject as applied to foot-and-mouth disease.

Mal de caderas and its treatment with Bayer 205 [trans. title], F. Schmidt and M. de Oliveira (*Arch. Schiffs u. Tropen Hyg., 28 (1924), No. 3, pp. 91–100, figs. 2*).—The authors find Bayer 205 to cure small laboratory animals artificially infected with *Trypanosoma equinum*, no ill effect resulting. It is effective when administered to both naturally and artificially infected equines. The curative dose recommended for Brazilian subjects is 7 to 9 gm., administered at intervals of a week in doses of 2, 2, and 3; or 3, 3, and 3 gm. The protective effect of a single dose of 2 to 3 gm. lasts at least a month. A list of six references to the literature is included.

A study of rabies from the standpoint of etiology, R. A. Kelser (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 6, pp. 678–689, figs. 6*).—The author reports upon studies made at the Army Medical School.

His study of the tissue of the central nervous system of rabbits inoculated subdurally with fixed virus has demonstrated the presence, 72 hours after such inoculation, of bodies having the morphological and staining characteristics of Negri bodies, undergoing cyclic changes. These bodies were as large as those commonly noted in street virus infection, and were found dividing by fission. Another type of minute, highly refractile body, similar to that described by other investigators, was found in considerable numbers 48 hours later, subsequent to infection. The grouping of these small bodies, in several instances, suggested that they had possibly just been liberated from some type of "parent" cell. The author's findings lend support to the contention that the Negri bodies are a type of protozoan organism primarily responsible for the disease.

Progress of bovine tuberculosis eradication work in the United States, J. A. Kiernan (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt. 12 (1923), pp. 332–345*).—This account, by the chief of the tuberculosis eradication division, U. S. D. A. Bureau of Animal Industry, was presented at the annual meeting of the International Association of Dairy and Milk Inspectors held at Washington in September and October, 1923.

The biology of ascarids and ascarid pneumonia [trans. title], A. Martin (*Rev. Vét. [Toulouse], 76 (1924), No. 2, pp. 69–76*).—This is a discussion of the life history and habits of ascarids, particularly *Ascaris lumbricoides* in swine, and of ascarid pneumonia or thumps.

Spirilla as the cause of abortion in cattle [trans. title], J. Witte (*Berlin. Tierärztl. Wchnschr., 39 (1923), No. 52, pp. 553–555*).—In the author's investigations of 27 bovine fetuses, *Bacillus abortus* was isolated 11 times, spirilla 5, pseudotuberculosis bacilli 1, and paratyphoid bacilli 1, with negative results in 9.

Damaged sweet clover: The cause of a new disease in cattle simulating hemorrhagic septicemia and blackleg, F. W. Schofield (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 5, pp. 553–575*).—Investigations of a new disease occurring in Ontario show it to be entirely distinct from hemorrhagic septicemia and blackleg, which it simulates. It is produced by a toxic substance which is present in moldy sweet clover, and there is much evidence that certain molds are responsible for the formation of the poisonous principle.

The foot maggot, Booponus intonsus Aldrich, a new myiasis-producing fly, H. E. Woodworth and J. B. Ashcraft (*Philippine Jour. Sci., 22 (1923), No. 2, pp. 143–156, pls. 8*).—In their discussion of this pest the authors report that Hereford cattle are much more susceptible to attack of the foot maggot than are carabaos. The maggots have been taken from Hereford, Nellore, and Philippine cattle, carabaos, and goats.

Piroplasmoses of sheep in Algeria.—Preliminary note [trans. title], F. Lestoquard (*Bul. Soc. Path. Exot., 17 (1924), No. 2, pp. 122–128, fig. 1*).—In observations of numerous cases of piroplasmosis of sheep in Algeria in 1923, the author detected three forms, namely, *Babesiella ovis* Babès, *Gonderia ovis* Du T., and *Theileria ovis* Littlew. The last mentioned did not appear to be pathogenic.

Porcine erysipelas, J. W. Parker, A. Lockhart, and J. D. Ray (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 4, pp. 451–456*).—Observations conducted with a view to determining the lesions that are commonly associated with urticaria and necrotic dermatitis are reported upon, which include the findings in 110 cases of the disease.

Bacterium abortum (Bang) isolated from the fetus of an aborting mare, S. H. McNutt and C. Murray (*Jour. Amer. Vet. Med. Assoc., 65 (1924),* *No. 2, pp. 215, 216)*.—The authors record the isolation from the foal of an aborting mare of an organism which laboratory study has shown to belong to the abortion Malta fever group, and which is apparently *B. abortum*.

Enzootic encephalitis of the horse [trans. title], R. Moussu and L. Marchand (*Rec. Méd. Vét., 100 (1924), Nos. 1, pp. 5–44, pls. 3, figs. 15; 3, pp. 65–90, figs. 3*).—This is a report of clinical observations, transmission experiments, and therapeutic and anatomo-pathologic investigations of Borna disease. The authors conclude that the disease is caused by a filterable virus.

Report of the commission appointed to inquire into the sclerostomiasis in Holland.—I, Zoological part.—Vol. I, The adult strongylids (sclerostomes) inhabiting the large intestine of the horse, J. E. W. Ihle (*The Hague: [Govt.], 1922, I, vol. 1, pp. 118, figs. 131*).—This report of studies includes an account of the structure of the strongylids of the horse (pp. 8–14), remarks on the ecology and on the occurrence of the strongylids of the horse in Holland (pp. 14–16), classification of the strongylids (pp. 16–18), descriptions of the Strongylidae (50 species representing 8 genera, namely, Strongylus 4 species, Triodontophorus 5, Craterostomum 3, Cylicostomum 31, Poteriostomum 2, Oesophagodontus 1, Gyalocephalus 1, and Cylindropharynx 3) occuring in the colon and cecum of the horse, the donkey, and the zebra (pp. 18–110), and a bibliography of three pages.

A contribution upon the occurrence and the life history of tapeworms of the horse [trans. title], G. Stroh (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 24 (1923), Nos. 2, pp. 105–124, pls. 3; 3, pp. 173–193, figs. 2*).—The author found that of 2,012 horses slaughtered at Augsburg, Bavaria, from 1914 to 1918, 1,125, or 55.9 per cent, were infested by tapeworms. Of these 1,045, or 51.9 per cent, were infested with *Anoplocephala perfoliata* Goeze; 229, or 11.4 per cent, with *A. mamillana* Mehlis; and 47, or 2.3 per cent, with *A. magna* Abildg.

The dog: Hygiene, diseases, J. Pertus (*Le Chien: Hygiène, Maladies. Paris: J.-B. Baillière & Sons, 1923, rev. and enl. ed., pp. 414, figs. 111*).—A new edition of this practical handbook (E. S. R., 16, p. 1136).

Diseases of poultry, R. Gwatkin (*Ontario Dept. Agr. Bul. 305 (1924), pp. 32, figs. 21*).—This is a practical summary of information of the more important diseases of poultry.

Perfect physical recovery of a fowl may follow an attack of a septicemic disease, B. F. Kaupp and R. S. Dearstyne (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 5, pp. 623–627, figs. 2*).—The authors present the record of a Single Comb Rhode Island Red hen in which an initial septicemia developed following the feeding in the drinking water of a virulent strain of *Bacterium sanguinarium*. This hen recovered without showing marked clinical symptoms. That the disease had developed in the hen was shown by the temperature rise, blood study, and the recovery of the organism from the blood of the wing vein. A second bird, which was inoculated with a culture of the recovered organism, developed an acute septicemia from which it died, showing typical symptoms, post-mortem findings, and microscopic and bacterial confirmations. The recovered fowl completely regained her former physical powers, since in confinement on the proper ration she produced a normal, spring-cycle production in eggs.

The macroscopic agglutination test as influenced by the fatty content of the blood serum of fowls.—I, Effect of starvation upon fatlike content, E. R. Hitchner (*Jour. Amer. Vet. Med. Assoc., 63 (1923), No. 6, pp. 759–768*).—"The blood sera of hens in heavy lay gives very unsatisfactory results in the macroscopic agglutination test for bacillary white diarrhea. The high fat content of the sera interferes with the accurate interpretation of the results.

Starving fowls for at least 36 hours previous to bleeding results in clear sera and excellent tests. Starvation causes a marked decrease in egg production, with a slow recovery after four days."

On the habitat of Ascaridia perspicillum (Rud.), J. E. ACKERT (*Jour. Parasitol., 10 (1923), No. 2, pp. 101–103, pl. 1*).—The author finds from the administration of embryonated eggs of *A. perspicillum* to young chickens and from post-mortem examinations at the Kansas Experiment Station that the normal habitat of this nematode is the small intestine, especially the duodenum and jejunum. The larvae seldom inhabit the liver, lungs, or other organs outside of the intestine, though two larvae were taken from the liver of a chick, seven from the lungs of three chicks, and one larva from the trachea of another chick.

Flukes of the genus Collyriclum as parasites of turkeys and chickens, W. A. RILEY and H. C. H. KERNKAMP (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 5, pp. 591–599, figs. 3*).—This is a contribution from the Minnesota Experiment Station, in which the authors record the occurrence of a fluke of the genus Collyriclum in a flock of turkeys on the shore of Lake Minnetonka, in northwestern Minnesota and in a flock at a point 25 miles from Minneapolis.

Out of the 110 6- to 8-week-old poults in the first mentioned flock, 50 showed the cysts of the parasite, which occurred not only on the perianal region, but were found in various cases to extend quite generally over the ventral surface of the abdomen and breast and in rare instances even about the beak, on the neck, etc. Several hens were also found to be affected. Although not previously recorded from domesticated birds, it or a closely related species is known to occur in various passerine birds.

Temperature, pulse, and respiration of foxes, K. B. HANSON and H. L. VAN VOLKENBERG (*Jour. Amer. Vet. Med. Assoc., 64 (1923), No. 2, pp. 210–215*).—This is a report of investigations conducted by the U. S. D. A. Bureau of Biological Survey. The authors found in apparently healthy foxes, caught and held, that the average temperature was 103.9° F., with a range from 101 to 107.9°; the average pulse rate was 130, with a range from 71 to 274; and the average frequency of respiration was 54, with a range from 20 to 216. It is not believed that these represent the actual normal, since a certain deviation apparently occurs when the animal is disturbed by being caught and held.

RURAL ENGINEERING.

Farm engineering, B. B. ROBB and F. G. BEHRENDS (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1924, vol. 1, pp. XVII+454, figs. 470*).—This is one of the so-called Wiley Farm Series, edited by A. K. Getman and C. E. Ladd. It contains practical information on the performance of certain mechanical processes on the farm. Chapters are included on harness repairing; knots, hitches, and splices; belts, pulleys, and shafting; soldering; painting; leveling; farm drainage; concrete work; a farm water system; and sewage disposal.

Kent's mechanical engineers' handbook, W. KENT, rewritten by R. T. KENT (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1923, 10. ed., pp. XVI+2,247, figs. 1,052*).—This is the tenth edition of this well-known mechanical engineering handbook, the first edition of which was issued in 1895. In this revision the book has been entirely rewritten, space being devoted to each subject in accordance with its importance. It is stated that in spite of the utmost condensation the available material is more than 50 per cent greater than that of the previous edition.

Annual report of the agricultural engineer, Burma, for the year ending June, 1922, Maung Ba Gyaw (*Burma Agr. Engin. Ann. Rpt. 1922, pp. 31*).—This report deals with work in Burma during the year ended June, 1922, on farm buildings, wind mills, pisé-de-terre construction, and sugar-cane crushers and furnaces.

Administration report on irrigation branch for the year 1921–22, H. deL. Pollard-Lowsley (*Cent. Provs. and Berar [India], Irrig. Branch Admin. Rpt. 1921–22, pp. [155], pls. 3*).—This is a review of the work of the irrigation branch of the Public Works Department of the Central Provinces and Berar, India, during the fiscal year 1921–22.

Review of the work of the irrigation department, Central Provinces, for the year 1921–22, H. deL. Pollard-Lowsley (*Cent. Provs. [India] Irrig. Dept. Rev. 1921–22, pp. [23]*).—A brief account of the work of the irrigation department of the Central Provinces, India, during the year 1921–22 is presented.

Review of the work of the irrigation department, Central Provinces, for the year 1922–23, H. deL. Pollard-Lowsley (*Cent. Provs. [India] Irrig. Dept. Rev. 1922–23, pp. [50]*).—The work, expenditures, and revenues of the irrigation department of the Central Provinces, India, are summarized for the year 1922–23.

Reports on irrigation in the Incomati, Maputo, and Umbeluzi Rivers, J. A. Balfour (*Relatórios sôbre Irrigação nos Vales do Incomati, Maputo e Umbeluzi. Lourenco Marques: Repart. Agr. Prov. Moçambique, 1922, pp. [82], pls. 7*).—General information and data on proposed irrigation projects on three rivers in Portuguese East Africa are presented.

Measurement of seepage losses in canals, O. V. P. Stout (*Agr. Engin., 5 (1924), No. 4, pp. 82, 83, 90*).—In a contribution from the University of California information on methods of measurement of seepage losses from canals is presented.

It is concluded that to insure reliability and accuracy within practicable limits, the water cross section at the upper gauging of a set should be similar in form to that at the lower, the mean velocities should be approximately equal at the two sections, and the range and distribution of velocities should be about the same. The gauging sections should be as far apart as is consistent with other considerations. Any inflow except at the upper gauging station and any outflow except at the lower gauging station are objectionable. The range of velocities should preferably not include those lower than 1 ft. per second nor those higher than 3 ft. per second except in large canals, in which the range may be extended without impairment to the accuracy of the measurements. Steadiness of stage should be sought.

On the velocity of flow in sewers partly full, M. T. M. Ormsby (*Surveyor and Munic. and County Engin., 65 (1924), No. 1679, pp. 297, 298, fig. 1*).—Tabular and graphic data on the velocity of flow in sewers partly full are presented and discussed mathematically.

The hydrogen ion concentration of lime treated water and its effect on bacteria of the colon-typhoid group, R. D. Scott and G. M. McClure (*Jour. Amer. Waterworks Assoc., 11 (1924), No. 3, pp. 598–604*).—Studies conducted at the Ohio State University on the relation of the H-ion concentration of treated water to the coli bacteria content are reported.

References are cited which indicate that bacteria of the colon-typhoid group are destroyed in media of low H-ion concentration, the limiting value being in the neighborhood of pH 9.5. The results of examinations of samples from water purification plants indicated that this limiting pH value applies also to water. The point is raised that processes involving lime treatment, in the course of which the water attains a low pH value, may possess an advantage over others in bacterial efficiency.

Is tile drainage a real source of profit in farming? H. B. Roe (*Agr. Engin., 5 (1924), No. 4, pp. 75–79, figs. 4*).—In a contribution from the Minnesota Experiment Station data on the economics of tile drainage on Minnesota farms are presented, showing the economic effects of increasing the tillable area within the present farm limits and in squaring up fields and the influence of drainage on the quantity and quality of crops. It is stated that there is too little accurate evidence available to warrant the drawing of any hard and fast conclusions, but that what is available emphasizes the importance and great need for more extended research in drainage.

It is suggested that studies should be undertaken of economical and efficient methods of drainage installation and a correlation between waste land reclamation within the farm limits and the normal income from and value of tillable land, of soil permeability for the most efficient depth and spacing of drains for the prompt removal of excess moisture from the soil, of agricultural development of peat lands through drainage and control of the ground water level, and of the causes of failure of draintile.

The utilization of salvaged war explosives in cut over land reclamation, J. Swenehart (*Agr. Engin., 5 (1924), No. 4, pp. 84, 85, 87, figs. 3*).—In a contribution from the Wisconsin Experiment Station experiments on the use of sodatol for blasting stumps are reported.

It is noted that sodatol is a mixture of 45 per cent TNT and 55 per cent sodium nitrate. The resulting mixture is more sensitive than TNT or picric acid and less sensitive than nitroglycerin dynamite. It is said to be detonated with an ordinary No. 6 blasting cap or electric blasting cap. It does not freeze and will not deteriorate in storage if kept dry. It is said to be 15 or 20 per cent stronger than the ordinary dynamites.

Experiments with white pine stumps in moist soil indicated that sodatol is a satisfactory blasting explosive. Although being slower than picric acid or high-grade dynamite, it is less efficient for blasting rocks by the mud capping method. Sodatol is too insensitive for so-called propagated ditch blasting. Its use requires either an electric blasting cap in each charge, or, if conditions are favorable, a primer of straight nitroglycerin dynamite may be used.

Cultivation of soil with explosives [trans. title], A. Sacchi (*Istria Agr., n. ser., 2 (1922), No. 24, pp. 577–583*).—Data on the breaking of six different types of soil by use of the explosive influence of ballistite are briefly summarized. The soils varied from shallow rocky material covered with bushes to deep productive soils of a high state of fertility and cultivation.

The necessary depth of blasting varied from 70 cm. (27.5 in.) to 1 meter (3.28 ft.). Holes were bored 10 cm. in diameter, and were separated by distances of 1 meter for rocky soil, 1.25 meters for gravelly soil, and 1.4 meters for productive soils free from roots. The charge of ballistite necessary for the proper breaking of the different soils varied from 200 to 300 gm., compressed into cartridges.

Cost data for each soil are included.

Rural highway pavements—maintenance and reconstruction, W. G. Harger (*New York and London: McGraw-Hill Book Co., Inc., 1924, pp. XVI+637, pls. 2, figs. [218]*).—This volume presents basic data ordinarily used in the design, construction, maintenance, and reconstruction of rural highways, and illustrates them with examples of current and recommended practice. It contains chapters on general administrative considerations, general engineering principles of pavement design and type selection for specific roads, details of design and construction, maintenance and reconstruction, and minor points of design, together with six appendixes.

Materials of construction, their manufacture and properties, A. P. Mills (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1922, 2. ed., pp. X+[476], figs. [192]*).—This is the second edition of this book, edited by H. W. Hayward. It contains information on the manufacture, properties, and uses of the more common materials of engineering construction. Chapters are included on plaster, lime, and natural cement; Portland cement and concrete; stone; bricks and other clay products; the ferrous metals, nonferrous metals, and alloys; timber; rope; and mechanical fabrics.

The concrete yearbook, 1924, edited by O. Faber and H. L. Childe (*London: Concrete Pubs., Ltd., 1924, pp. XIV+336, figs. 23*).—This is a handbook and directory for the concrete industry. It contains chapters on cement, essential factors in making good concrete, proportioning concrete mixtures, standardization in the proportioning of concrete, surface treatment of concrete, concreting in cold weather, reinforced concrete and fire resistance, concrete floors, concrete roads, tables for reinforced concrete design, memoranda for concrete users, bibliography of concrete and reinforced concrete, and professional institutions and trade associations. Directory and catalogue sections are included.

Does paint preserve wood? H. D. Tiemann (*Sci. Amer., 130 (1924), No. 5, pp. 314, 315, figs. 6*).—Data are reported from studies conducted at the U. S. D. A. Forest Products Laboratory which showed that paint is not proof against gradual absorption of moisture and therefore will not prevent the occurrence of swelling or shrinkage in wood. It does, however, retard the rate of absorption or loss of moisture through the surface of wood, thus giving time for a partial equalization of the moisture and reduction of the moisture gradient within the wood.

It is further shown that paint does not make wood poisonous to wood-destroying fungi, but by preventing the surface cracks it makes it more difficult for the fungi to get a foothold and thus helps to preserve the wood. The equalization of the moisture distribution throughout a piece of wood brought about by a coating of paint when applied to all surfaces also prevents excessive warping of the piece as a whole.

History of the windmill [trans. title], E. Turrière (*In Congrès de l'Eau, 1923. Compte Rendu des Travaux. Montpellier: Roumégous & Déhan, 1923, pp. 119–132*).—A brief historical review is given of the development of the windmill from the primitive theories to the modern dynamic theories.

Windmill with vertical axle [trans. title], P. Amans (*In Congrès de l'Eau, 1923. Compte Rendu des Travaux. Montpellier: Roumégous & Déhan, 1923, pp. 133–145, figs. 5*).—A brief technical discussion is given covering the theory of the vertical axle windmill.

Electrification of farms in Sweden, T. Holmgren (*Elect. World, 83 (1924), No. 4, pp. 178–182, figs. 5*).—Swedish experiments on the application of electricity to farm processes are outlined in some detail, and the conclusion is drawn that an economically sound electrification of rural districts requires the cooperation of the vast majority of the farmers. A thorough investigation of the proper system of distribution should be made before the details of electrification are decided. The design and size of transformers on the farms, the magnetizing current of motors, and the diversity factor at threshing are considered to be points of great importance in this connection. It is stated that in Sweden the consumption of energy in the first year is commonly confined to lighting and threshing, but that the load increases from year to year to about 18 kw. hours per acre. It is usually possible to electrify where the area of cultivated ground amounts to 25 or 30 per cent of the total area.

Implement and machinery textbook, W. Strecker (*Geräte- und Maschinenlehre. Berlin: Paul Parey, 1922, 12. rev. ed., pp. VIII+318, figs. 312*).—This is the twelfth revised edition of this book, which is one of the textbooks of agriculture edited by G. Krafft.

[Machinery and implement studies at the Pusa Research Institute], W. Sayer (*Agr. Research Inst., Pusa, Sci. Rpts. 1922–23, pp. 85–88*).—Working costs and analytical results for different operations in the use of steam plowing tackle are tabulated and discussed briefly (E. S. R., 49, p. 85). Data on cultivation by five motor tractors are also included, showing that the wheel types used are too light and of too low a power for deep plowing. They are extremely useful for light and shallow cultivation with disk harrows or cultivators.

Machine threshing and seed grain [trans. title], M. Ringelmann (*Jour. Agr. Prat., n. ser., 41 (1924), No. 6, pp. 111–113*).—Data from different sources are summarized to show that machine threshing of seed grain has a tendency to so injure it mechanically as to reduce its germinative powers, especially if treated with copper sulphate.

Germination tests of hand and machine threshed grain when treated with copper sulphate gave results in favor of the hand threshed grain. Tests of treated and untreated machine threshed grain also favored the untreated grain. A comparison of grains of wheat, rye, barley, and spelt injured to destruction by hand and machine threshing showed that the loss from machine threshing was from two to four times as great as that from hand threshing. The injury was greater the larger the seeds. Pointed teeth gave better results than flail teeth in the threshing cylinder. It is concluded that for seed grain the threshing, if mechanical, should be performed in two operations, the first being a slow-speed operation.

Estimating building costs, C. F. Dingman (*New York and London: McGraw-Hill Book Co., Inc., 1923, pp. VIII+240*).—This is a handbook of information on the estimation of building costs. It contains chapters on excavating, grading, and bracing; brickwork; stone work, cement block work, and architectural terra cotta; fireproofing and fireproof construction; plain and reinforced concrete; timber framing; boarding, planking, and shingling; finished carpenter work; structural steel and iron work and steel sash; lathing, plastering, and stucco work; painting and paper hanging; roofing and sheet metal, damp-proofing, and waterproofing; and short-cut methods of estimating.

Research problems in the design of tobacco barns, J. B. Kelley (*Agr. Engin., 5 (1924), No. 4, pp. 88–90, fig. 1*).—In a contribution from the University of Kentucky some of the unsolved research problems involved in the design of a barn for air curing tobacco, particularly White Burley tobacco, are enumerated and discussed. Special reference is made to such factors as ventilation, temperature, moisture, and bacterial action.

RURAL ECONOMICS AND SOCIOLOGY.

Tractors and horses in the winter wheat belt, Oklahoma, Kansas, Nebraska, H. R. Tolley and W. R. Humphries (*U. S. Dept. Agr. Bul. 1202 (1924), pp. 60, figs. 16*).—A study was made of the use of power on 390 farms on which tractors were owned, the Department, the Kansas State Agricultural College, and the College of Agriculture of the University of Nebraska cooperating. Personal visits were made during August and September, 1921, to each farm and data obtained with respect to the work done during the year with the tractor and with horses, the cost of using the tractor and of keeping work stock, changes in the operation and organization of the farm after the purchase of a tractor, and opinions and ideas concerning its use. The investigation included also 85 farms on which tractors were not owned but which were comparable in size to those on which tractors were being used. The areas selected for the investigation were Harper County, Kans., and Alfalfa County, Okla., together referred to as the southern area; Thomas, Sheridan, Trego, Gove, and Logan Counties, Kans., known as the western area; and Phelps and Kearney Counties, Nebr., termed the northern area. The following table summarizes the more important points brought out in the investigation concerning the 354 farms operated with one tractor in 1921:

Details of operation on farms on which one tractor and horses were owned.

Item.	Southern area.	Western area.	Northern area.	Total or average.
Number of farms	120	107	127	354
Size of farm……acres	326	842	377	500
Crop area per farm……do	262	516	299	352
Area in wheat (seeded 1920)……do	218	407	177	259
Tractor work per year:				
Drawbar (home farm)……hours	365	350	203	302
Belt (home farm)……do	24	19	33	26
Custom……do	50	53	41	48
Total……do	439	422	277	376
Fuel per year for drawbar work:				
Gasoline……gallons	531	345	111	324
Kerosene……do	301	379	332	336
Oil per year for drawbar work……do	57	54	34	48
First cost of tractor……dollars	1,499	1,556	1,375	1,473
Estimated total life……years	6.8	6.3	7.4	6.8
Annual cost of repairs and upkeep……dollars	106	46	57	71
Cost of using tractors for drawbar work:				
Per year……do	588	520	357	484
Per hour……do	1.61	1.49	1.76	1.60
Work stock per farm……number	7.5	10.2	7.4	8.3
Horse labor:				
Per farm per year……hours	3,690	3,816	4,206	3,914
Per head per year……do	472	393	566	482
Cost per hour of horse labor……cents	22	18	13	17
Cost of keeping work stock:				
Per farm……dollars	583	522	517	541
Per head……do	76	50	69	64
Cost per year of power for drawbar work:				
Total (tractor and work stock)……do	1,171	1,042	874	1,025
Per crop acre……do	4.47	2.02	2.92	3.17
Horse labor equivalent to total drawbar work:				
Per farm……hours	6,812	7,483	5,930	6,670
Per crop acre……do	26	15	19	19
Proportion of total drawbar work done with tractors..per cent	45	46	28	40
Increase in size of farm after purchase of tractor……crop acres	18	98	44	50
Work stock per farm if tractors were not used……number	10.1	15.2	9.6	11.7
Necessary work stock per farm in addition to tractor……do	5.7	7.4	6.5	6.5
Crop acres per horse:				
Before purchase of tractors	26	34	31	30
1921	35	51	40	42
Potential crop acres per horse	46	70	46	54
Reduction in family and regular hired labor……months	1.2	2.5	0.8	1.4
Net increase in combined cost of power and labor due to using tractors……dollars	343	157	172	206
Proportion of owners who changed tillage practice……per cent	69	62	65	66
Proportion who believed tractors responsible for increased yield per acre……do	29	14	20	21
Proportion who believed present tractors would be profitable……do	78	84	65	75
Proportion who intend to buy others……do	75	85	59	72

In the following table are summarized some of the results of the investigation on 85 farms operated with horses only:

Details of operation on farms on which tractors were not owned.

Item.	Southern area.	Western area.	Northern area.	Total farms.
Number of farms	26	31	28	85
Size of farm .... acres	316	779	376	504
Crop area per farm .... do	250	446	288	334
Area in wheat (seeded 1920) .... do	196	323	164	232
Work stock per farm .... number	9.8	12.2	9.3	10.5
Value per head .... dollars	108	71	111	94
Necessary work stock per farm .... number	9.8	11.7	8.7	10.1
Cost of keeping work stock:				
Per farm .... dollars	838	670	608	701
Per head .... do	84	54	65	66
Horse labor:				
Per farm per year .... hours	6,819	6,658	5,561	6,346
Per head per year .... do	709	565	610	624
Cost per hour of horse labor .... cents	13	10	12	11
Increase in size of farm, 1918 to 1921 .... crop acres	9	78	42	45
Crop acres per horse:				
1918 .... do	25	33	28	30
1921 .... do	26	37	31	32
Crop acres per necessary horse .... do	26	38	33	33

With respect to the reliability of tractors it is indicated that on the average the 354 tractors were out of running order 10.6 days during the year but were needed for an average of only 2.1 days of work during that time. No great difference in reliability was shown among the different sizes. Considering those which had been out of order when needed, the time lost by each machine amounted on the average to 5, 4.7, and 4.5 days in the southern, western, and northern areas, respectively.

Data are presented in detail showing the costs on two farms in each of the three areas, on which six farms the costs of power were very small. Data are presented by way of comparison covering the farms on which tractors were not owned, those on which no horses were owned, and those on which two tractors were owned.

Production costs and storage of mangels, M. E. McCollam (*Western Washington Sta. Bimo. Bul., 12 (1924), No. 1, pp. 22–24, figs. 2*).—The production costs tabulated and discussed here were obtained from records kept on a 5-acre demonstration field of mangels grown in 1923 at the station. Man labor was charged at the rate of $3 and horse labor at $1 per day of eight hours. Tractor work exclusive of operator's wage was charged at $4 per day of eight hours. The labor cost per acre up to harvest amounted to $52.90, seed and fertilizer bringing the total cost up to harvest to $65.40. The labor cost of harvest was $51.81, and the total cost per ton of mangels $3.23. The proper placing of mangels in a pit for winter storage is described.

Cane production costs in Cuba, W. J. Lauck (*Facts About Sugar, 18 (1924), No. 15, pp. 346, 347*).—Some of the data from a study of production costs presented before the U. S. Tariff Commission at hearings March 27 and 28, 1924, are abridged here. Certain elements in the cost of producing sugar are described. It is indicated that the cost of producing cane per pound of sugar amounts to from 0.7 to 1.22 cts., according to degree of cultivation.

Analysis of cost and profit of native agriculture [trans. title], A. M. P. A. Scheltema (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Afd. Landb., No. 6 (1923), pp. 5–76, figs. 12*).—Data are submitted by A. J. Koens with reference to rice cultivation in the Preanger Regencies in the Dutch East Indies, as well as information obtained in the Province of Surakarta by F. Boogerd. The former indicate that much labor is required in planting, weeding, and harvesting rice, the amount varying considerably. The variation, however, is relatively small for plowing, harrowing, and leveling, and the average costs of these operations show little range. Rice cultivation in this region is said to be intensive as to labor and as compared with rice cultivation in Italy and the cultivation of hoe crops in the Netherlands. On the other hand, it is extensive as regards capital investment.

The data obtained in the second instance indicate that in the Province of Surakarta during 1922 labor in rice cultivation in general did not pay, due to the low prices of rice.

Economic and social conditions of North Carolina farmers, compiled by C. C. Taylor and C. C. Zimmerman (*[Raleigh]: N. C. Tenancy Comn., [1923], pp. 87*).—A study of the question of landownership and tenancy in North Carolina was carried out by a special commission on tenancy made up of representatives of the higher educational institutions, the State division of markets, and the Bureau of Agricultural Economics, U. S. D. A. A survey including 1,014 farm families was carried out in Edgecombe County in the Coastal Plain section, Chatham in the Piedmont, and Madison in the Mountain section.

The tenants and croppers in two of the three counties surveyed had over 99 per cent of all their land planted to crops which were strictly fertility exhausting rather than soil improving. The landless farmers universally were found to have fewer livestock than the landowners, to produce less of their home food supply, and to have a lower cash income; likewise they live in poorer houses and under poorer health conditions, are more illiterate, take fewer papers and magazines, read fewer books, attend church and Sunday school less frequently, have fewer home amusements, and support community affairs less often. It is brought out that the cash income of the white tenants and croppers of the Mountain counties is less than 10 cts. per day per individual.

Over 75 per cent of all the landless farmers surveyed use short-time credit to carry on their farming operations. Thirteen per cent of all the farm lands included in this survey are being farmed by insolvent men. Seventy-five per cent of the landless farmers are sons of landless farmers.

Land reform in Czechoslovakia, L. E. Textor (*London: George Allen & Unwin, Ltd., 1923, pp. 157, pls. 3*).—After spending seven months in Czechoslovakia studying the problems of land reform, the author prepared this treatise. The laws and decrees which are cited have been assembled from official and other sources. The discussion covers the historic and economic basis for land reform; political parties and the law providing for expropriation; long-lease farmers, dispersed parcels, and compulsory lease; the land office; mismanaged estates; the law of allotment; the question of compensation; commassation; and the opposition. An appendix presents graphical representations of data concerning the estates subject to expropriation under the law of April 16, 1919.

Share tenancy in Italy, G. Costanzo (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 2 (1924), No. 1, pp. 3–42*).—Before the war in Italy, except as a rule in Tuscany, the terms of share-tenancy contracts called for an equal division of the product except in the case of olives and mulberries. Afterwards in 1919 and 1920 the produce-sharing agreements were modified, particularly in relation to the apportionment of the expenses, a larger share of which was assigned to the owner. After 1921, however, there was a return to the traditional mezzadria with the equal division of expenses and produce. The object of this article is to explain the fundamental principles of the recent agreements made in different specific sections of the country, in order to set forth this form of share tenancy and its function in national agricultural reconstruction.

Agricultural holdings: Their disintegration and reunion into economic units, D. BALAKRISHNAMURTHI (*Jour. Madras Agr. Students' Union, 12 (1924), No. 2, pp. 53–61*).—The evil of excessive subdivision of agricultural land is said to be accentuated in India by the laws of inheritance among the Hindus, as well as by the tendency of laborers to cultivate small tracts in their spare time. Remedial efforts are briefly outlined.

Studies and information relative to the agricultural colonization of the Spanish Protectorate in Morocco, A. DE TORREJÓN Y BONETA ET AL. (*Estudios e Informe Relativos a la Colonización Agrícola de la Zona de Protectorado de España en Marruecos. Madrid: Junta Cent. Colon. y Repobl. Int., 1923, pp.* [2]+*290, pls. 20, figs. 6*).—This publication comprises papers setting forth the agriculture of the western portion of the Spanish Protectorate of Morocco, outlining proposed plans of colonization, and describing the organization and work of agricultural experiment stations there.

Report of a farm credit survey of four townships, Foster County, North Dakota, R. E. WILLARD (*North Dakota Sta. Bul. 175 (1924), pp. 26, fig. 1*).—An area in Birtsell, Estabrook, Longview, and Mellville Townships in Foster County, N. Dak., was selected for this study, and complete records pertaining to 1923 were obtained from 61 owners and 45 tenants. The average size of farm operated was found to be 575 acres. Of the 465 acres per farm in crops in this region, 217 acres were devoted to wheat, 24 to corn, 5 to alfalfa and sweet clover and 45 to other hay, 61 to oats, 41 to barley, 17 to rye, and 13 to flax.

The complete wheat sales per farm amounted to $337, which represents a gross income of $1.55 per acre from wheat. An average of six milch cows gave an average annual cash income per farm of $234. The average gross sales per farm amounted to $968, the amount being slightly larger on owned farms than on tenant farms. The average income per farm from wheat amounted to 35 per cent of the total, rye 3, flax 6, milch cows 24, other cattle 9, hogs 10, and poultry 4 per cent. The average value of all livestock per farm was $1,755.

The average investment for the owned farms was $29,419, of which the income represents an annual turnover of 3.5 per cent. The average assets per farm amounted to $29,419 for owners and $3,426 for tenants. Of the 61 farm owners, 55 had first mortgages, 19 second mortgages, and 3 third mortgages against their farms. Only 4 owners had no outstanding obligations. The average net worth of all owners amounted to $18,102, and that of the tenants was $1,507. The liabilities of owners and tenants, respectively, represented 38 and 56 per cent of their assets. Twenty-nine of the owners carried State hail insurance on their crops and 29 carried life insurance.

On a conservative basis it is estimated that 25 of the 59 per cent of the owners included in this survey who expressed a desire for a Government loan were eligible to receive it. Of the 38 tenants who desired it, 28 appeared to be qualified to receive it.

Farm labor in Massachusetts, 1921, J. C. FOLSOM (*U. S. Dept. Agr. Bul. 1220 (1924), pp. 26, figs. 5*).—In conducting this study a personal canvass was made throughout seven localities in the State characterized by a particular type of agriculture as follows: The Connecticut River Valley in Hampshire and Franklin Counties where tobacco and onions predominate, the town of Colerain devoted to apple growing, the town of Barre where dairying and general farming are important, and lower Plymouth County around Wareham, the center of cranberry growing, and the town of Falmouth, of strawberry growing; also Marthas Vineyard Island, characterized by farming for summer resort markets, and southeastern Middlesex County around Arlington, where market gardening predominates. Also questionnaires were sent by mail to employers and to farm laborers. To the employer schedule 622 replies were received and 395 farm laborers working for wages were reached.

Cranberry picking is shown to demand large numbers of hand workers, and tobacco is gathered largely by crews of six or more working as a unit. Dairy and livestock farms show the least seasonal variation in numbers of employees.

Massachusetts farmers obtain most of their labor locally, largely by acquaintance and personal search. They patronize employment agencies but little. There is no State regulation of employment agencies, and the typical employment agency official makes no effort to determine an applicant's fitness for the work for which he applies.

The six-day week is the rule among Massachusetts farmers. Sunday and holiday chores and emergency work were expected of farm hands on about half of the farms. The most common wage rates on the farms studied were for men $3 per day in harvest and at other times $40 or $50 per month with board or $78 per month without board, for women $2 per day at other than harvest time. Harvest-time wages for women were largely on a piecework basis. In some districts in the State farmers practically never furnish board and room, while in others they expect thus to accommodate many or all of their unmarried employees. Two-fifths of the farm workers interviewed had no savings, one-third stated that they had bank accounts, and almost one-fourth had title to real estate. One-third of the farm laborers interviewed had schooling equivalent to less than five grades of grammar school. Another third had from five to nine grades. Two-thirds of the laborers had never engaged in other than unskilled employment.

Dockage in wheat in North Dakota, A. H. Benton (*North Dakota Sta. Bul. 172 (1924), pp. 15, figs. 7*).—This bulletin presents facts regarding dockage in wheat from Foster County, N. Dak., and from the State as a whole. Attention is given to the increase in returns that farmers may secure through the reduction of dockage and other foreign material. The sources of information include data collected by the college from five farmers' elevators handling grain from the county studied, data furnished by the Bureau of Agricultural Economics, U. S. D. A., and that obtained by the college through questionnaires returned by 248 farmers' elevators.

Crops and Markets, [April, 1924] (*U. S. Dept. Agr., Crops and Markets, 1 (1924), Nos. 14, pp. 209–224; 15, pp. 225–240; 16, pp. 241–256; 17, pp. 257–272*).—Abstracts of current market information, notes on the position in the market of important classes of crops and livestock, tabulations of weekly receipts and prices with summaries and comparisons, and brief notes on foreign crops and markets are presented in these numbers.

Final report [of the] departmental committee on distribution and prices of agricultural produce, Marquis of Linlithgow et al. (*London: Min. Agr. and Fisheries, 1924, pp. 42, pls. 2*).—The final report of a committee previously noted (E. S. R. 50, p. 293) is made in these pages, reviewing investigations into the methods and costs of marketing and distributing agricultural, horticultural, and dairy produce and the difference between the prices received by the producer and those paid by the consumer. It discusses recent movements in agricultural prices and the spread between producers' and consumers' prices, as well as the marketing problems of the producer, the responsibilities and privileges of distributors of food, transportation and wholesale and retail factors in distribution, the place of cooperation, and the importance of the collection and publication of price statistics. It is recommended that consideration should be given by the Government to the possibility of introducing standard units of sale, and further continuous investigation is urged.

Prices and wages in India, D. N. Ghosh (*India Dept. Statis., Prices and Wages India, 37 (1923), pp. [1]+VI+246, pl. 1*).—Statistics are presented in this annual report bringing up to date the series previously noted (E. S. R., 47, p. 298).

Agricultural co-operation in India, H. Calvert (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 2 (1924), No. 1, pp. 43–61*).—The two factors of the prevailing religions and the caste system are said to affect directly the cooperative movement in India, making progress difficult. The first act legalizing cooperative credit societies was passed in 1904 and applied only to credit. This was replaced by another in 1912, which permitted other forms of cooperation than for providing credit and made provision for secondary societies. Their working and the many difficulties encountered are described. In recent years other experiments in cooperative organization have been undertaken, such as cattle insurance and societies for purchase and sale and for providing manure, agricultural implements, seeds, and household needs.

Monthly Supplement to Crops and Markets, [April, 1924] (*U. S. Dept. Agr., Crops and Markets, 1 (1924), Sup. 4, pp. 113–144, figs. 4*).—Current and comparative statistics of acreage, condition, production, stocks, and market receipts are given for specific crops, and producton forecasts are made. Numbers of livestock produced and marketed are reported. Data with reference to exports and imports and prices of farm products are presented. The farm labor demand and supply are tabulated in percentages of normal for the years 1920 to 1924, inclusive. Reports are made upon the livestock and meat situation and livestock inspection, the cold storage holdings on April 1, 1924, and the shipments of fruits and vegetables by States during March and for the season ended March 31, and several articles setting forth the supplies of Florida cabbage in New York and Chicago, the production of late cabbage in the principal producing States, American and German consumption of cotton, and other items also appear.

AGRICULTURAL EDUCATION.

The Bureau of Education: Its history, activities, and organization, D. H. Smith (*Inst. Govt. Research, Serv. Monog. U. S. Govt. No. 14 (1923), pp. XIII+157*).—This is one of the series of descriptive monographs dealing with the various services of the United States Government previously noted (E. S. R., 50, p. 696). It is drawn up according to the uniform plan of all, giving the history of the establishment and development of the bureau; its specific activities; its organization for the handling of these activities; the character of its plant; a compilation of the laws and regulations governing its operations; financial statements showing its appropriations, expenditures, and other data for a period of years; and a full bibliography on the sources of information. The Morrill and other land-grant acts and legislation providing vocational education are noted, and the history of activities in connection with agricultural and rural education is recounted.

Vocational agriculture in Missouri high schools, W. T. Spanton (*Missouri State Bd. Vocat. Ed. Bul. 15 (1924), pp. 99, pls. 9*).—Information is furnished to school officials, superintendents, and teachers relative to the establishment, development, and maintenance of classes of vocational agriculture in secondary schools in Missouri.

Vocational home economics in Texas (*Tex. State Bd. Vocat. Ed. Bul. 159 (1923), pp. 79, figs. 22*).—A summary of vocational home economics work in Texas from 1917 to 1923 is presented, together with a statistical report covering the period. Plans for 1922–1927 are then outlined.

Mexico's rapid progress in vocational education, F. T. Weinburg (*Bul. Pan Amer. Union, 58 (1924), No. 6, pp. 578–584, figs. 6*).—This describes briefly four schools for girls, night classes for working women, and a technical school training boys for the building trades.

Agricultural education and the crisis in agriculture (*Agr. Prog. [Agr. Ed. Assoc., London], [1] (1924), pp. 7–32, 35–50, 59–63*).—These pages present an abstract of the evidence submitted on behalf of the Agricultural Education Association to the Tribunal of Investigation, March, 1923. The vocational system of agricultural education in Great Britain is broadly outlined. Certain improvements deemed necessary are further facilities for a sound general education for farmers' sons and daughters, with a system of scholarships from rural schools to agricultural colleges, arrangements allowing for greater prominence to be given to economics and especially farm accountancy in the two- or three-year college courses for farmers, further application of the principles of the Danish high schools to farm institute or college courses, including more schools of the farm institute type, and the encouragement of the highest type of scientific courses in agricultural colleges and university departments for specialists, research workers, and teachers. The memorandum then proceeds to outline improvements which may be brought about through education dealing with general economics, crop production, and livestock. In appendixes certain specific data presented to the tribunal are published. The signed abstracts of evidence are as follows: Farm Book-keeping, by A. G. Ruston; The Value of a Forage-cropping System to British Farming, by J. C. Brown; and Milk Recording and Advisory Work on Feeding of Dairy Cows, by J. Mackintosh.

[Conference papers and proceedings of meetings of the Agricultural Education Association] (*Agr. Prog. [Agr. Ed. Assoc., London], [1] (1924), pp. 50–59, 63–77, 79–108*).—The following papers which were read at the Aberystwith and London meetings in July and December, 1923, respectively, are published here: The Importance of Strain in Red Clover, by R. D. Williams; Pig-keeping, by W. A. Stewart; Comparative Costs in Relation to Farm Management, by J. S. King; Various Kinds of Silos, by A. W. Oldershaw; The Effect of Various Potash Manures on the Growth and Quality of the Potato, by T. Eden; Sugar Beet in Relation to Arable Farming, by R. N. Dowling; Balance in Nutrition, by J. L. Rosedale; and the following comprising a group on the technique of teaching: The Function of the College Course, by A. D. Hall; Agricultural Organizers' Advisory Visits to Farms, by J. G. Stewart; Agricultural Discussion Societies, by D. B. Johnstone-Wallace; Organized Courses in Derbyshire, by J. R. Bond; Syllabus of the Farm Institute Course, by W. A. Stewart; Single Lectures for Adult Farmers, by G. H. Garrad; Manual Processes, by J. Porter; Manual Processes, by R. C. Gaut; and Young Farmers' Clubs, by J. A. Caseby. The proceedings of the two meetings are reported in the form of abstracts of committee reports, with signed discussions.

The organization of a general introductory course in soils, with special reference to the laboratory exercises, H. O. Buckman, P. E. Karraker, and R. I. Throckmorton (*Jour. Amer. Soc. Agron., 16 (1924), No. 2, pp. 86–91*).—Early in 1923 a subcommittee of the American Society of Agronomy was appointed to study the laboratory work in elementary soils given at the several agricultural colleges in the United States. Questionnaires were sent out, together with requests for copies of the current laboratory outlines, and replies to the questionnaire were received from 39 institutions teaching courses in soils. Laboratory outlines were submitted by 23 institutions.

Three per cent of the colleges were found to be giving a 6-hour course, 27 a 5-hour course, 40 4 hours, 27 3 hours, and 3 per cent 2 hours a week. The tendency seems to be toward a 4-hour course consisting of 3 lectures and 1 laboratory per week, or 2 lectures, 1 recitation, and 1 laboratory period. The following are the laboratory exercises deemed most desirable, as indicated by the outlines submitted but listed without regard to their possible laboratory sequence: Study of soil minerals (fertility viewpoint); weathering and soil formation (directed toward soil processes); qualitative study of important soil constituents (such as K, P, and Ca); soil organic matter (nature, amount, nitrogen content, etc.); volume weight determinations (with specific gravity and pore space calculations); mechanical analysis (simple form) and soil particle study (with practice in the naming of soils in field condition); temperature studies (with practical relationships, especially to soil moisture); soil survey (study of maps and reports, and also simple field work when conditions justify); absorption by soils (principles of absorption with practical relations); soil acidity tests (thorough practice, especially on qualitative methods); bacterial activities (nitrification is easily handled); alkali and alkali soils (for arid and semiarid sections); lime and liming (forms and characteristics of lime); fertilizers (forms, characteristics, and identification tests); lime, fertilizer, and general fertility problems; and opportune field trips to study various practical phases of soil condition and management.

Suggested outlines for study of vocational home economics in rural and small high schools in Texas, J. W. Harris (*Tex. State Bd. Vocat. Ed. Bul. 166 (1923), pp. 69, fig. 1*).—The material presented in this bulletin was assembled as a seminar problem in a course in household arts education at Columbia University in the summer of 1923. It is intended to give the necessary information and help in initiating home economics in the rural schools. Study outlines have been drawn up for courses in health education, food study, home care of the sick, clothing, and home sanitation. Numerous reference books and available bulletins are listed.

MISCELLANEOUS.

[Twenty-ninth, Thirtieth, and Thirty-first Annual Reports of Tennessee Station, 1916–1918], H. A. Morgan et al. (*Tennessee Sta. Rpts. 1916, pp. 18, fig. 1; 1917, pp. 14, fig. 1; 1918, pp. 16, figs. 2*).—These reports contain the organization lists, reports of the director and heads of departments, and financial statements for the fiscal years ended with June 30 of each year. The experimental work is for the most part abstracted elsewhere in this issue. Feeding trials with steers are also briefly noted.

[Thirty-second, Thirty-third, Thirty-fourth, and Thirty-fifth Annual Reports of Tennessee Station, 1919–1922], C. A. Mooers et al. (*Tennessee Sta. Rpts. 1919, pp. 20, figs. 3; 1920, pp. 18, fig. 1; 1921, pp. 19, fig. 1; 1922, pp. 22, fig. 1*).—These reports include data corresponding to the above but were prepared under the supervision of the vice director. The report for 1919 also contains resolutions adopted by the board of trustees of the university in memory of the late Dr. Brown Ayres and a biographical sketch by S. H. Essary on the late Samuel McCutchen Bain.

Bimonthly Bulletin [of the Western Washington Station] (*Western Washington Sta. Bimo. Bul., 12 (1924), No. 1, pp. 24, figs. 6*).—In addition to articles abstracted elsewhere in this issue, this number contains brief articles entitled White or Calf Scours, by J. W. Kalkus; Mangel and Carrot Varieties, by M. E. McCollam; Mites, Lice, and Fleas, by G. R. Shoup; Tuberculosis of Chickens, by W. T. Johnson; and Methods of Controlling Common Insect Pests of Garden and Orchard, by A. Frank.

NOTES.

California Station.—Dr. Filippo Silvestri, of the Regia Scuola Superiore di Agricoltura at Portici, Italy, was appointed June 1 as entomological explorer. For the present his headquarters will be located in Hongkong, China, in connection with a search for beneficial insects to strengthen the biological control of injurious insects in California.

Georgia Station.—F. R. Edwards has been appointed animal husbandman vice D. G. Sullins, resigned, and entered upon his duties July 15.

Louisiana Stations.—A very successful field day for the sugar planters of the State was held at the sugar house on the new university farm, two miles from Baton Rouge, on July 31. About 600 people were in attendance, and much interest was manifested in the sugar cane seedling work of the station. Plans have been perfected for a series of 15 meetings throughout the sugar belt during September, at which members of the station staff, the extension service, and the United States Department of Agriculture will speak on methods of combating sugar cane diseases and insect pests.

A new hay and mule barn has been completed at the Sugar Station, as well as a cottage for laborers.

A. F. Kidder, whose resignation as agronomist has been reported in these columns, has been reinstated in his former position. Dr. E. C. Tims has been appointed assistant plant pathologist, entering upon his duties August 1. Rogers Dodson has been appointed specialist in soy beans, beginning June 15.

New Jersey College and Stations.—The appropriations granted to the stations by the legislature aggregate $295,800, an increase from $279,150. Of this amount $85,000 is for salaries, wages, and maintenance, an increase of $5,000; $15,000 for publications; $18,000 for mosquito extermination; $5,800 for the oyster investigations; $25,000 for poultry husbandry studies, an increase of $5,000; $14,500 for inspection work, including $8,500 for seeds, $1,000 for insecticides, $2,000 for legume inoculants, and $3,000 for creamery inspection; $3,000 for experimental work with vegetables; $70,000 for extension work; $5,000 for cranberry investigations; $10,000 for egg-laying and breeding contests; $12,000 for special experimental work on potatoes, sweet potatoes, and tomatoes; $6,000 for poultry exhibitions and premiums; $5,000 for sewage studies; $3,000 for apicultural investigations; $3,500 for a study of the root rot of peas; $2,500 for experimental work in vegetable production in northern New Jersey; $2,500 for experimental work with small fruits; $5,000 for combating the oriental peach moth; $4,000 for an experimental brooder house; and $1,000 for a horticultural field building.

The field day held on the campus June 18 attracted over 1,800 persons.

Mrs. Ida S. Harrington, home management specialist, retired from extension work July 1 after 12 years' service in seven States. Carl R. Woodward returned as editor June 10. Charles A. Doehlert resigned as assistant editor July 15.

Oklahoma College.—W. A. Conner, director of the agricultural extension service from 1921 to 1923, has been reappointed to that position, effective July 1, to fill the vacancy caused by the resignation of E. A. Miller.

Rhode Island College and Station.—Paul S. Burgess, Ph. D., resigned as chemist August 1 to become head of the department of agricultural chemistry in the Arizona University and Station. R. P. Tittsler, assistant in animal breeding and pathology in the station and in bacteriology in the college, resigned September 1 to accept a position in the Pennsylvania College.

Tennessee Station.—T. D. Harden, assistant chemist, resigned August 15 to engage in commercial work and has been succeeded by Dr. R. M. Barnette.

Utah College and Station.—Director William Peterson, of the station, has also been appointed director of the agricultural extension service.

Virginia Truck Station.—T. B. Griffin, of Churchland, has been appointed a member of the board of directors of the station vice J. G. Eberwine, whose term expired May 20. W. L. Strong has been appointed assistant entomologist, effective July 1.

Wyoming Station.—Robert H. Burns has been appointed assistant wool specialist, beginning July 1.

Fourth International Conference on Soil Science.—This conference was held at the International Institute of Agriculture from May 11 to 19. About 150 delegates were in attendance, representing about 20 countries. The delegates from the United States included Director J. G. Lipman and Dr. S. A. Waksman, of the New Jersey College and stations, Dr. M. M. McCool, of the Michigan College and station, and Dr. C. F. Marbut, head of the United States Department of Agriculture Soil Survey. To the last named of these the *Record* is mainly indebted for the account which follows:

The conference was opened with a general session attended by the King of Italy. Following a plan agreed upon at the third conference at Prague in 1922, it was organized into six sections before which several hundred papers were presented. There were also four general meetings, at three of which addresses were given as follows: Nitrification and Its Agricultural Significance, by Prof. G. André, of the National Institute of Agronomy of Paris; Recent Advances in Soil Physics, by Dr. B. A. Keen, of the Rothamsted Experimental Station; Dispersoid Chemistry and Its Relation to Soil Science, by Prof. G. Wiegner, of Zurich; The Modern Goal in Soil Bacteriology, by Prof. J. Stoklasa, of Prague; The Fertilizer Industry of the United States in Relation to Soil Science, by Dr. Lipman; and Analyses of Soils and Their Value, by Prof. A. Menozzi, director of the Royal College of Agriculture of Milan.

The remaining general session was devoted to a broad discussion of soil acidity, in which all the sections united. The conference was interspersed with and followed by several excursions to points of interest and official receptions.

The section meetings were in charge of standing committees dealing, respectively, with soil physics and mechanical analysis, soil chemistry, soil bacteriology and biochemistry, soil nomenclature and classification, soil mapping, and plant physiology in relation to soils. About 35 papers were presented to the first of these committees, of which 11 took up drainage and other amelioration work and a like number the mechanical analysis of soils. Most of the latter group were descriptive of various new methods, the definition of the various soil classes into which soil particles should be grouped in making such analyses proposed by Atterburg before his death being generally accepted.

The program of the committee on soil chemistry also embraced about 35 papers, of which 12 dealt with soil acidity and 6 each with plant nutrition and fertilizers and base exchange in the soil solution. The discussion of the last-named topic was led by the honorary president of the International Pedological Committee, Dr. E. Ramann, of Munich, who supported the view that base exchange alone is produced by neutral salts, hydroxids and salts with alkaline reaction giving base exchange and adsorption, acids and acid salts decompose the silicates, and an exchange between the cations and the hydrogen of the acids causing the formation of acid soils. On the other hand, Dr. Wiegner maintained that base exchange in clay or soil is a special case of the so-called "polar" exchange adsorption and is intimately linked up with the degree of dispersion of the clay.

Of the 36 papers presented to the committee on soil bacteriology and biochemistry, that of Dr. Stoklasa was a general discussion of the relation of microbes to soil fertility, the others being widely distributed as to scope.

The program of the committee on soil classification covered all phases of the subject but especially the basis of classification, whether that of the soil characteristics as advocated by American workers or that of the forces and processes involved in soil evolution as maintained by many Russian investigators. Unusual emphasis was directed toward the importance of the soil profile or soil section and the basing of differentiation of a secondary order on the perfection or completeness of its development. In all, 24 papers were presented and discussed, including a summary of them all by the chairman, Dr. B. Frosterus of Helsingfors, Finland. Five papers dealt especially with classification in its broad rather than local phases. These were presented by Prof. A. Till, of Vienna; Drs. H. Stremme and B. Aarnio (jointly), of Danzig and Helsingfors; Dr. G. Murgoci, of Bucharest; Prof. D. K. Glinka, of Petrograd, and Dr. Marbut. At the close of the committee's discussions, a resolution presented by Dr. Aarnio was adopted proposing that during the next few years a special effort be made by all students of the soil to accumulate as full information as possible on soil characteristics as expressed in their profiles, to the end that in the next congress or an early succeeding one a system of soil classification may be based thereon.

A monograph on soil mapping presented by Dr. Murgoci contained 58 papers showing the existing status of this work in the United States, the European countries except Russia, Spain, and Portugal, North Africa, the Italian colonies, and Rhodesia. The various phases of the subject were discussed in a number of meetings, and it was voted to recommend to all countries that within the next two years a soil map of each country on a small scale be prepared and published showing the distribution of the predominant soil types as defined on the basis of the most significant and widely prevalent soil characteristics.

At a final general session of the conference the International Society of Soil Science was organized, with Dr. Lipman as its first president. Dr. D. J. Hissink, of Groningen, Holland, who had been in active charge of the Rome conference, was chosen acting chairman and general secretary, and a vice president was selected from each country participating. The various committees were continued except for a combination of those on soil classification and soil surveys and maps into a single committee headed by Dr. Marbut and with subcommittees for Europe and the United States.

The object of the society was announced as the promotion of soil science by means of conferences, the formation of special committees for cooperative work, the publication of a review journal, and the institution of a central office in the International Institute of Agriculture. Decision was reached to take over the *Internationale Mitteilungen für Bodenkunde* as the official organ of the society, publication to be made through the International Institute of Agriculture. The United States was selected as the place of the fifth conference, the probable time being in 1927.

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EXPERIMENT STATION RECORD.

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The Pan-Pacific Food Conservation Conference at Honolulu in the first half of August was, in many respects, a unique gathering. It was a conference in the very best sense. It was a coming together of scientific men, mainly specialists in branches of agriculture and fisheries, but it was not an occasion for the presentation of research papers. Instead it was one for comparison and explanation of conditions, for exchange of information and views, and for bringing the best scientific knowledge to bear on subjects relating to the varied food problems of the great Pacific area. Its mission was a practical one; its method was essentially that of the symposium or round table, rather than of a learned society with a formal program of new technical contributions.

Practically every country in the Pan-Pacific area was represented by one or more delegates. They came from Australia, New Zealand and Fiji, from Japan and Taiwan (Formosa), from China, French Indo-China and Siam, from Java, the Philippines, Mexico, and the United States. Altogether, some twenty countries were represented by upwards of 140 delegates.

The conference was organized in seven sections, prominent among which were fisheries and marine biology, the sugar industry, food crop production and improvement, and plant quarantine, the latter including entomology and plant pathology. There were also sections on animal industry, food transportation and distribution, and international law and agreements. In the meetings of these sections, to which the afternoon was usually devoted, the detailed discussions were held, while the numerous general sessions in addition to business matters gave opportunity for the presentation of subjects of broad general interest to the conference, and summaries from the deliberations of the sections.

The social features formed no small part in developing the friendly spirit of the conference. They brought the members together almost daily in pleasant relations with each other and with the local people of various organizations and races, at luncheons, banquets, and typical entertainments arranged for their benefit. These, with the unusually interesting character of the meetings, served to hold the attention and sustain the interest of the delegates through a continuous period of two weeks.

The atmosphere of the various Pacific countries, given by the different races resident in Hawaii who have preserved their native habits and traditions, made an appropriate setting for such a conference. And, what was quite as important, it helped to impress upon the delegates the human aspects of the food question as distinguished from purely those of production, a phase of no small importance as represented by deep-seated habit and the traditions of ages.

In his address opening the conference Governor Farrington called attention to the steadily growing neighborly sentiment prevailing among the races and nations of the Pacific, as illustrated by the widespread interest and hearty response to the call for the conference, and saw in it not only the determination to live and let live but to help others to live. It was thought appropriate that the first food conservation conference should be held in the Pacific, with the oldest civilizations and the greatest massing of population on the one side, and the greatest undeveloped areas and a development of science never equaled in history on the other. Citing the gigantic growth of production and trade in Pan-Pacific countries within the last ten years, the Governor showed that Hawaii's prosperity rests on the products of its soil which help to feed the world.

The address of Dr. L. O. Howard, of this Department, as chairman of the conference, dealt with the question of the future food supply viewed from the standpoint of increasing population. The world is not yet overpopulated, he declared, and in a strictly biological sense it will never be overpopulated by the human species or any other species. He explained that biologically the word "overpopulation" implies something unnatural, something beyond nature's laws, something impossible, since the old principle of the "balance of nature" may be depended upon to prevail. But in maintaining his position in this balance of nature man must see to it that he retains control over other species, lest he suffer for food. A great advantage of the human species lies in a collective mind and ability for concerted action. Other species represented by thousands of species of insects, for example, are far better adapted to continued existence upon the earth than is the human species. It is the birth of intelligence, the human mind when put to collective use, that places man in control and enables him to assume the commanding place.

Referring to the apprehension for the future food supply unless the present increase in the world's population is checked, Doctor Howard cited the vast opportunities for increasing production, and the enormous losses from insects and plant diseases, losses which can and must be very greatly decreased. Apart from the possibility of introducing birth control to retard overcrowding, he prophesied that the cooperation of the best brains, the pushing of human inventiveness, will result not only in better conserving the world's resources for the benefit of humanity, but in increasing them in ways that are not dreamed about as yet. This was declared to be the controlling idea of the conference.

While food conservation and increased production to meet inevitable requirements was the central topic of the conference, it had many of the aspects of a peace gathering, for a fair division of food among peoples is a measure of peace, and already serious inequalities are being felt. Hence the means of mitigating these deficiencies, often through bringing to bear the results of scientific progress, are steps in the direction of peace. The spirit of informality, of mutual interest, of brotherhood, which was the real heart of the conference, early gave it a deeper significance than that of purely scientific deliberation. Furthermore, a series of popular evening lectures by noted specialists attending the conference was arranged which aroused much interest and attracted large audiences.

A notable feature of the conference was that it concerned itself with large problems, considered from a broad standpoint. In these considerations the international viewpoint was constantly maintained; the participation of delegates from so many different countries did not permit it to be lost sight of. This fact compelled thinking in broad and sympathetic terms, and from the standpoint of international relations. In this way the interdependence of peoples, always recognized theoretically but lately emphasized by increasing intercourse and communication, gave color and form to nearly every subject which came up for discussion. The result was a broadening of understanding, and as the days went by the effect became more evident in the discussions.

It is not too much to say that the conference gave such a survey and understanding of conditions of production and consumption in Pan-Pacific countries as has never before been effected. It developed an appreciation of many questions not generally realized, which are becoming of vital importance to their respective localities. It also clarified the reasons for policies and regulations of different countries and showed the obstacles to change.

Many interesting instances were brought out of the factors which have influenced the agriculture of particular sections to make it what it is, such as environment, transportation facilities, traditions, the food habits and the methods of life of the people. Labor conditions have, of course, a large influence in the farm practices followed, and account for the tremendous amount of hand labor frequently involved in tropical agriculture. This is illustrated, for example, by the continued practice in Java, in rice harvesting, of cutting off the heads by hand, favored by the abundance and cheapness of labor. Many quaint examples of " moon farming " and various superstitions in connection with seeding and other processes were cited.

The fixed character of the diet of certain peoples and the extreme difficulty in changing the food habits has a great influence on the agriculture and on the adequacy of the food supply, preventing the partial substitution of new or unfamiliar materials. Objection to the cutting off of timber discourages the growing of upland rice, because that crop means the clearing of land which, after a few years, is abandoned and another tract denuded. The factor of transportation is responsible for shortages of food and famine as, for example, in China, where the extension of food production to large available areas and the movement of food supplies is prevented by the lack of modern transportation means.

While the present tendency of progressive agriculture is to take every advantage of favorable environmental conditions, in some instances this has not followed, for reasons cited, with the result that environment continues to dominate the people. They have worked out, in spite of it, systems and practices which are made to suffice under somewhat adverse conditions, and change is difficult to effect. These things, as in other parts of the world, are reflected in the degree of prosperity and development of the farming people. Along with a high degree of adaptability to conditions in certain lines, there has been a lack of adaptability or an adherence to adverse conditions, which in the course of generations has brought about the inevitable results.

Considerations of this sort were disclosed in connection with the discussion of agricultural research and extension, to which one session was devoted. They illustrate some of the handicaps and limitations in that direction. Much appreciation was expressed, however, of the experiment stations as a means of advancement in all parts of the Pacific area. In all countries represented, such institutions were looked to as a main reliance in improving the practice and developing the efficiency of food production. The increase in the number and support of these agencies was strongly advocated and, in that connection, the great advantage of central stations provided with adequate laboratories and trained experts to carry on the advanced lines of research was urged from widely separated quarters.

The importance of an adequate diversification of crops in the Pacific countries was shown, in order to give a greater measure of economic security and to better utilize the varied resources and conditions found in them. This is a matter which has not received adequate attention in some cases, with the result that agriculture has been mainly confined to a limited number of specialized crops, with the resulting effect on the local food supply and on the outlook for the general farmer.

That the increase of food or changes in the type of production need to be undertaken with discrimination was maintained by several speakers. While advocating food conservation and increased production, a warning was sounded against enlarging the production of crops indiscriminately and without foreknowledge as to the effect upon the delicately adjusted agricultural balance. Similarly, the effect of upsetting the types of agricultural production by the introduction of other crops was illustrated by the present rice situation. Rice is the principal foodstuff in the Pacific, from the standpoint of consumption as well as of production and trade. It was estimated to form 50 per cent of the daily food of some 500,000,000 people. It has been the principal crop of many of the Pacific nations, but there is a growing tendency for rice-using countries to import more and more every year, even among those that have been self-supporting in the past. This is because they have turned from rice culture to export crops, such as tobacco, coffee, tea, sugar, and rubber, yielding larger returns. As a result the rice question in that area is regarded as one of outstanding importance, deserving of close study. The difficulty of substituting other cereals was reported as causing concern for the future supply of the staple food.

The sugar section was one of the most active ones, and its deliberations were followed closely by a considerable group. This was natural from the prominence of this crop in many of the Pacific countries, the highly developed character of the practices relating to its cultivation and manufacture, and the economic questions surrounding it. From a technical standpoint, perhaps no section gave more pronounced results than the sugar section. The fact that the industry is on so large and efficient a scale locally and that a world-reputed experiment station has been provided to promote its advancement lent special interest and opportunity to this branch of the conference. Some of the large plantations and sugar mills were visited, where improved varieties of cane and the latest engineering and factory methods were interesting features.

So also was the opportunity to see thousands of acres in pineapples, the effect of local environmental conditions on that crop, the successful use of sulphate of iron spray in adapting the crop to manganous soils, a product of the work of the Federal Experiment Station in the Islands, and the extensive pineapple canneries equipped with the most modern appliances, which turn out a pack of approximately 6,000,000 cases a year.

Some of the special difficulties which have been encountered in the development of agriculture were strikingly illustrated by examples from Australia. Two pests in particular were mentioned by

Sir Joseph Carruthers, heading the delegation from that country. One of these was the prickly pear, which from a single specimen carried into the country to adorn a garden has spread to an impenetrable cactus maze, covering vast areas and increasing at the rate of a million acres a year. Methods of suppression or reclamation which are economically practicable have not yet been found, although prizes have been offered and many proposals tested. The aid of science in combating this pest is earnestly sought.

More familiar is the rabbit pest, in combating which success has been more promising. In New South Wales alone, 115,000 miles of rabbit-proof fences have been erected, at a cost of £6,800,000. A curious fact in the fighting of this pest was the development of a conflict of interests between landowners who are endeavoring by every means to rid their lands of the pest, and trappers who discovered they could secure such returns from the skins that they opposed extermination. The profits from trapping drew labor from the farms where it was employed in fighting the pest. The industry of exporting skins and meat has grown to about £5,000,000 a year, but fencing, digging out, poisoning, and other means are still employed to hold this enemy under control.

The subject of quarantine against plant pests, and the combating of these pests of various kinds, naturally had a large place in the conference. The representatives from this Department pointed out the large factor which these pests constitute in food production, and told of the steps taken to secure adequate inspection laws in the United States. The spread of pests was said to have kept pace with the advancement of transportation. Prompt notification to other countries of the discovery of a new pest was urged. This was cited as a type of cooperation which would mean much in preventing the spread of these enemies to agriculture.

A definite product of the conference was embodied in a series of resolutions covering a quite wide range of subjects and expressing the combined view of the conference as to advantageous procedure. These have been published, and in addition it is planned to issue a report of the proceedings, with abstracts of the various papers. Many of the papers will doubtless be printed in full in journals devoted to their special fields. On the whole, the tangible product of this conference of nearly 150 representatives is a highly creditable one and can hardly fail to mark a distinct step, not only in improved understanding but in a knowledge of problems and methods for their solution.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Colloid chemistry, T. SVEDBERG (*New York: Chem. Catalog Co., Inc., 1924, pp. 265, figs. 115*).—The text of this monograph is based upon a series of lectures given at the University of Wisconsin in 1923 and consists of a general survey of colloid chemistry, with special attention to recent quantitative investigations.

Theory and practice of colloids in biology and medicine, W. KOPACZEWSKI (*Théorie et Pratique des Colloïdes en Biologie et en Médecine. Paris: Vigot Bros., 1923, pp. XII+308, figs. 112*).—This reference book and manual on colloid chemistry contains an introductory section on the general properties of colloids and their significance in physiology, pathology, and thereapeutics, followed by sections dealing, respectively, with colloidal statics and colloidal dynamics. In the first of these sections are included chapters on introductory practice, diffusion, dialysis, ultrafiltration, viscosity, surface tension, osmosis, cryoscopy, electrical conductivity, H-ion concentration, electrical transportation, refractometry, ultramicroscopy, nephelometry, and photometry. The chapter headings of the section on colloidal dynamics include colloidal preparations, adsorption, stabilization and sedimentation of suspensions, dispersions and flocculation of suspensoids, peptonization and coagulation of emulsoids, and syneresis. Each chapter contains a discussion of the theoretical principles of the experimental method, a description of apparatus, data obtained by the method, and various applications of the method.

The chemistry and physiology of the nucleins, including an introduction to the chemistry of purin bodies, R. FEULGEN (*Chemie und Physiologie der Nukleinstoffe nebst Einführung in die Chemie der Purinkörper. Berlin: Borntraeger Bros., 1923, pp. XII+432, figs. 4*).—In this monograph, the section on the chemistry of the nucleins consists of three parts dealing, respectively, with the nitrogen-containing constituents of nucleic acids and related bodies, the nucleic acids, and the protein compounds of the nucleic acids. The section on the physiology of the nucleins includes a discussion of the occurrence and physiological significance of the nucleins, nuclein metabolism, and the physiology of methyl purins, together with a chapter on the pathology of purin metabolism by F. Feulgen-Brauns. An extensive list of literature references is given as footnotes.

A method of determining the biological value of protein, H. H. MITCHELL (*Jour. Biol. Chem., 58 (1924), No. 3, pp. 873–903*).—A method of measuring the biological value of proteins is described, and the results are reported of a critical investigation of its accuracy. The method is based upon nitrogen balance data obtained on rats under definite experimental conditions, which are essentially as follows:

The rats are kept in large crystallizing dishes 190 mm. in diameter and 100 mm. in depth, provided with weighted wire covers from which are suspended food crucibles in wire frames and inverted tubes for water. Two or three layers of filter paper are placed in the bottom of each dish to absorb the urine. The rations are mixed thoroughly in the wet and generally steam cooked (except for the vitamin preparations which are added later), spread out in thin layers, dried at low temperature, broken up, ground fine, dried for several days in an oven at from 40 to 50° C., and then analyzed for total nitrogen. The ration is weighed out each day into the crucible and mixed with a little water to prevent scattering. The following day the residue is scraped out and dried at the same temperature as the original rations. The dried residue accumulating during a week is weighed and subtracted from the total food fed.

The urine and feces are collected daily, the urine by washing the dish and paper thoroughly with boiling water acidified strongly with sulphuric or hydrochloric acid. The washings are filtered into a 250-cc. volumetric flask, cooled, made up to volume, and emptied into 2.5-liter bottles containing crystals of thymol. Analyses are made on a 50- to 250-cc. aliquot of the week's composite sample. The week's collection of feces is digested with H_2SO_4 and K_2SO_4 until completely oxidized, the residue transferred to a volumetric flask, and an aliquot taken for distillation.

The experiments reported were in general of one week's duration, with 3-day intervals before changing from one ration to another. The body weights were taken at the beginning and end of the experiment. Data are reported showing a high degree of accuracy in the method.

In using the nitrogen balance data for determining the biological value of the proteins in the sense in which the term was originally used by Thomas as representing the amount of protein digested and absorbed from a given protein intake, account must be taken of the fractions of fecal and urinary nitrogen that are not of dietary origin. Data are presented showing that the amount of fecal nitrogen derived from the body, as determined by the output on a nitrogen-free diet, varies to some extent with the amount of roughage consumed, varies directly with the amount of food consumed, and tends to increase during an extended series of balanced periods. To overcome some of these variations it is recommended that, if possible, the roughage content of the nitrogen-free diet approximate that of the protein-containing diet, that the excretion of fecal nitrogen be calculated per gram of food consumed and the figure applied to the amount of protein-containing food consumed in subsequent experimental periods, and that the figure be redetermined at intervals if the experiments are continued over a long period of time.

Similarly, the amount of urinary nitrogen of body origin is calculated from determinations of the excretion in periods on a nitrogen-free diet. This assumes a constant basal metabolism of nitrogenous substances, and in support of this assumption data are presented showing that the excretion of nitrogen resulting from the catabolism of the tissues is not depressed to any extent by protein feeding. "There seems to be a true basal catabolism of nitrogenous substances in the tissues, such that the amount of nitrogen of body origin excreted in the urine when an animal is on a protein-containing dietary may be satisfactorily measured by the total excretion of nitrogen in the urine in an adjacent period of feeding a nitrogen-free diet. While this endogenous catabolism of nitrogen does not seem to be affected by an influx of amino acids from the intestinal tract, it may vary markedly in the course of a protracted series of metabolism experiments for unknown reasons, so that in such a series of experiments it is essential to redetermine the intensity of the endogenous catabolism by periods in which nitrogen-free diets are fed, if the most reliable biological values for protein are desired."

The biological value of the protein is finally taken as the percentage of the absorbed nitrogen (nitrogen intake minus fecal nitrogen of dietary origin) that is not eliminated in the urine.

The amino acid distribution in proteins of wheat flours, with a note on an improved method for the preparation of aldehyde-free alcohol, R. J. Cross and R. E. Swain (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 49–52*).—To determine whether differences in the baking qualities of different varieties of wheat are due to differences in the chemical constitution of the proteins, preparations of gliadin and of glutenin from four flours known to give markedly different results in the bakery were analyzed for amino acids by the Van Slyke method. Similar analyses were made of gliadin isolated from flour samples taken from different mill streams when grinding the same kind of wheat. Determinations were also made of the histidin content of the gliadin by the method of Koessler and Hanke and of the tyrosin and tryptophan content of the gliadin and glutenin by the method of Folin and Looney (E. S. R., 47, p. 504). The data reported have led to the following conclusion:

"The variations noted in the results for the different gliadin samples fall well within the variations shown in separate analyses on the same individual sample, so that the evidence offered points to the chemical identity of the gliadins from the different varieties of wheat and to the conclusion that the differences in behavior, if in fact they are attributable to the proteins present, are to be ascribed to differences in physical state rather than chemical constitution. The close agreement of the results of those determinations, such as cystin, tyrosin, and tryptophan, in which the probable error is small, lends particular support to this conclusion. The same comment may be made with respect to the glutenin samples, with the possible exception of the ammonia fraction, which seems to be somewhat lower in the Forty-Fold sample than was the case with the other samples examined. A new preparation of lime was used on this sample, which may have had something to do with the lower result noted here."

The estimation of the hydrogen cyanid content of amygdalin by the aeration method, J. H. Roe (*Jour. Biol. Chem., 58 (1924), No. 3, pp. 667–669*).—In the method described, the amygdalin is hydrolyzed by emulsion and the liberated hydrocyanic acid washed by a current of air into a second flask containing dilute alkali. The method is considered to be of general applicability to the determination of the hydrocyanic acid content of glucosids in cyanogenetic plants.

Chemical constituents of pecan oil, P. D. Boone (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 54, 55*).—By extracting pecan nuts of the Schley variety with ether in a Soxhlet apparatus, a yield of oil representing 75 per cent of the weight of the kernel was obtained. The oil, which was of a light yellow color and a pleasant odor and taste, had the following constants: Specific gravity, 20°/20° C. 0.9118; saponification value 191.5; acid value 0.80; iodin value (Hübl) 97.1; and n_D^{20}, 20°/20° C. 1.470. The distribution of fatty acids in the oil was calculated to be approximately as follows: Oleic acid, as glycerids, 80 per cent; linolic acid, as glycerids, 16; and palmitic and stearic acids 4 per cent. Evidence was obtained of the presence of phytosterol.

History of inulin, its discovery and methods of preparation, T. S. Harding (*Sugar [New York], 25 (1923), No. 12, pp. 636–638*).—The literature on the preparation of inulin is reviewed, and a method devised by the author is described, in which chicory root is used as the foundation material.

One kg. of the finely ground root is boiled with 5 liters of water for one hour and filtered. The residue is thoroughly washed with hot water, and the filtrate and washings, after cooling to 40° C., are treated with basic lead acetate solution to complete precipitation and the precipitate separated by means of a filter press. After removing the excess of lead with hydrogen sulphid, the solution is filtered with the addition of sufficient Norit to decolorize as much as possible. The filtrate is concentrated to a volume of about 500 cc., and 2 volumes of 80 per cent alcohol are added.

After standing in the cold over night, the precipitated inulin is filtered and purified by dissolving 150 gm. in 1 liter of hot 40 per cent alcohol and filtering after the addition of Norit. To the filtrate 2 liters of 80 per cent alcohol containing about 1 per cent of nitric acid by volume are added, and the solution is left in the ice box over night. The purified inulin which separates out is filtered and dried in vacuo at about 95° F.

The pancreas gland: The research and applied chemistry of its digestive enzyms and its internal secretion principle, B. T. Fairchild (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 41–47*).—This is an historical review of the chemical studies on the pancreas gland leading to the differentiation of its external and internal secretions and ultimately to the preparation of insulin. Several references to the literature are given as footnotes.

Some chemical reactions of the substance containing insulin, H. A. Shonle and J. H. Waldo (*Jour. Biol. Chem., 58 (1924), No. 3, pp 731–736*).—This paper summarizes the various chemical reactions of insulin observed in the course of unsuccessful attempts to determine its constitution and to discover some chemical reaction peculiar to the reactive principle. The conclusion drawn from the data obtained is that "the pancreatic substance containing insulin appears to be a complex mixture of proteoses, which give typical protein reactions and from which it has been as yet impossible to isolate a simple substance or to detect a chemical reaction that is characteristic of the physiologically active constituent. Further research must determine whether the active principle is a proteose or is merely intimately associated with a proteose fraction."

A simple method for the preparation of insulin by aqueous extraction, E. C. Dodds and F. Dickens (*Lancet [London,, 1924, I, No. 7, pp. 330, 331, fig. 1*).—"Outlined briefly, the method consists of extracting the pancreas with aqueous chilled formic acid and precipitating all the proteins from the fluid residue by the addition of saturated aqueous picric acid. The precipitate is filtered off and the moist picrates are extracted with acetone, thus dissolving out the insulin picrate. The acetone solution is filtered off and the contained picrate precipitated by dilution with water and picric acid. This crude insulin picrate is filtered off and dissolved in acid alcohol after the method of Dudley [E. S. R., 49, p. 808], and, on dilution with acetone, the hydrochlorid separates."

Apparatus for making momentary electrical contacts at regular intervals, H. W. Johnson (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 56, 57, fig. 1*).—The mechanism described and illustrated depends for its motive power upon a thin trickle of water into a narrow trough which empties successively into two tin cans, in one of which is inserted a rod provided with a brush for making the electric contact. It is said that the apparatus can be regulated to give contacts at various intervals of from 1 to 10 minutes.

Magnesium perchlorate trihydrate, its use as drying agent for steel and organic combustion analysis, G. F. Smith, M. Brown, and J. F. Ross (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 20–22, fig. 1*).—Magnesium perchlorate trihydrate is recommended as a substitute for phosphorus pentoxid in many dehydrating operations, particularly in the combustion analysis of organic compounds. A description is given of an improved method of preparing this dehydrating agent, starting with ammonium perchlorate and magnesium oxid or carbonate, and data are reported on a comparison of phosphorus pentoxid and magnesium perchlorate trihydrate in the combustion analysis of a number of compounds.

Observations on the Baudouin test, C. O. Gravenhorst (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 47, 48, fig. 1*).—For the quantitative determination of sesame oil in margarins, the Villavecchia modification of the Baudouin test is recommended, with a comparison of the color obtained with the color table. It is noted that care should be taken to avoid an excess of furfural. It is not considered so important that the hydrochloric acid should be free from chlorin as that its exact strength be known. Rancidity is said to interfere with the test, although not through the destruction of the reactive substance. The amount of crude sesame oil required to give the standard color has been found to vary with the origin of the seed, but refined oils seldom give a reading more than twice the standard.

A colorimeter which has been found satisfactory for comparing the reaction of oils with the standard color tables is described with diagram.

Influence of water-insoluble matter upon polarization of raw cane sugars, G. H. Hardin (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 55, 56; also in La. Planter, 72 (1924), No. 2, pp. 34, 35*).—"The water-insoluble matter content of a large number of raw cane sugars is given. The average specific gravity of the water-insoluble matter was found to be 1.87. The average percentage of water-insoluble matter of 96° Cuban centrifugal sugar was found to be 0.159, the range extending from 0.017 to 0.423. The water-insoluble matter consists of 87.5 per cent organic matter (cane fiber, etc.) and 12.5 per cent mineral matter (earth, scale, lime salts, etc.). The average error in polarization resulting from the presence of water-insoluble matter is +0.021 sugar degree, the range extending from +0.001 to +0.057. In the case of a sugar contaminated with 3.48 per cent sand, the error in polarization was found to be +0.35 sugar degree. Owing to the high water-absorption capacity of cane fiber, a direct ratio is noted between moisture content of the sugars and the insoluble constituents."

Sterilization of sugar solutions by Filter-Cel, R. Calvert and A. Knight (*Facts About Sugar, 17 (1923), No. 8, pp. 178, 179*).—Data are presented indicating that filtration with Filter-Cel is effective in removing from sugar solutions microorganisms tending to decompose the sugar.

Control of the reaction of juices and sirups by the determination of the hydrogen-ion concentration, H. F. Brewster and W. G. Raines, jr. (*Internatl. Sugar Jour., 25 (1923), No. 290, pp. 88–93*).—This is a general discussion of the application of colorimetric methods of determining H-ion concentration to the adjustment of sugar solutions before liming and sulphuring.

In liming juice phenol red is used as indicator, the end point being the slightest change from yellow toward pale orange. The standard for this is a buffer solution of pH 7. To follow the course of liming bromocresol purple is recommended as an indicator, the juice being limed to the point of deepest purple. In sulphuring, the end point pH 3.8 may be determined with either methyl orange or bromophenol blue. For liming back the sulphured juice, the same end point and indicator are used as in liming raw juice.

Fruit jellies.—II, The rôle of sugar, L. W. Tarr and G. L. Baker (*Delaware Sta. Bul. 136 (1924), pp. 29*).—In this continuation of the series of studies on fruit jellies (E. S. R., 49, p. 9), experimental work is reported on the function of sugar in jelly formation and on the effect of various factors on the inversion of cane sugar during the ordinary jelly making process.

In the first experiment, jellies were made with a constant amount of pectin, varying amounts of sugar, and sufficient acid to bring the H-ion concentration of the solution before boiling to pH 3.37, 3.23, and 3.1, respectively. The pectin and acid were measured into an agate pan and brought to the boiling point on an electric hot plate, after which the sugar was added and the boiling continued until the solution tended to sheet off from a silver spoon. The weight was then recorded and the finished jelly transferred to a jelly glass, covered, and allowed to stand for 12 hours. Although the weight of sugar varied from 100 to 180 gm., the percentage of sugar in the finished product varied only between 68.7 and 72.7 per cent. There was a tendency for a slight increase in the percentage of sugar with increasing H-ion concentration.

To determine the lowest concentration of sugar that could be employed, the quantities of pectin and sugar were kept constant at 2 and 100 gm., respectively, the H-ion concentration was adjusted to the same values as in the first experiment, and the mixtures were boiled to a definite weight. The greatest weight of jelly that could be produced under these conditions was 156 gm., representing a concentration of 64 per cent of sugar. Again it was shown that an increase in jellying properties was associated with an increase in the H-ion concentration. This would allow the use of smaller amounts of sugar with increased H-ion concentration, but, on the other hand, the quantity of sugar that could be added and still produce a good jelly increased with increasing H-ion concentration. With 2 gm. of pectin it was found possible to add from 125 to 130 gm. of sugar when the H-ion concentration was pH 3.37, 145 gm. at pH 3.23, and 180 gm. at pH 3.1.

A comparison of data on the solubility of cane sugar in water with the calculated percentage of sugar in the finished jelly showed that the jellies contained more sugar than that normally present in a saturated solution. This is thought to be due to the inversion of some of the sugar, the extent depending upon the acidity of the fruit juice and the time of heating. Since cane sugar is more soluble in invert sugar solution than in water, a greater amount of sugar would be dissolved.

In the study of the extent of inversion of cane sugar during jelly making, jellies were made from solutions regulated to definite H-ion concentrations by sulphuric, tartaric, or citric acid and a constant amount of pectin (2 gm.) and cane sugar in amounts of 100, 125, and 150 gm. were added. The volume of the solution before boiling was always made up to 125 cc. The invert sugar was determined in the finished product by the use of Fehling's solution.

With other factors constant, the amount of invert sugar increased with increasing H-ion concentration and with the length of time of heating and was independent of the nature of the acid used and the concentration of the sugar. In discussing the bearing of this work upon actual jelly making, it is pointed out that the sugar should be introduced at such a point in the process as to heat it with the fruit juice for a moderate length of time. This would reduce the quantity of invert sugar formed, and thus require less sugar to produce a saturated solution. "As too low a concentration of invert sugar is also undesirable, the best procedure would seem to be to form a moderate amount of invert sugar by introducing the cane sugar during the last half of the boiling down process. The quantity of invert sugar formed by this procedure would not be too great, and still it would be great enough to prevent undue crystallization of the cane sugar."

Attention is called in the discussion to a pectin that has been prepared by acidification of commercial pectin and subsequent precipitation with 95 per cent alcohol and reprecipitation. The purified pectin in water solution had a pH value of 3.1 and yielded an excellent jelly on the addition of water and sugar but without the addition of acid. Pectins as thus prepared are thought to offer commercial possibilities in jelly making in the saving of sugar and in retaining the original flavor of the fruit.

Experimental milling and baking, including chemical determinations, J. H. Shollenberger, W. K. Marshall, and D. A. Coleman (*U. S. Dept. Agr. Bul. 1187 (1924), pp. 54, figs. 33*).—Following a brief explanation of the scope of the work of the experimental milling and baking laboratory of the Bureau of Agricultural Economics, U. S. D. A., complete descriptions are given of the method of handling and analyzing the samples received for milling and baking tests, the experimental mill and its operation, the baking laboratory and the method used in baking, and the equipment and methods of analysis used in determining the chemical constituents of grain and mill products.

Variations in the weight of flour kept in 100-kg. sacks and in 500-gm. sacks and pasteboard cartons [trans. title], M. Arpin and M. T. Pécaud (*Ann. Falsif., 16 (1923), No. 182, pp. 586–597, figs. 3*).—Data are given on the loss in weight through evaporation of flour stored under varying conditions of temperature and moisture. The maximum loss in weight noted under the conditions of the experiment was 2.05 per cent for the large sacks, 4.6 per cent for the 500-gm. sacks of first grade flour, and 3.6 for the 500-gm. sacks of groats.

The destructive effect of microorganisms on raw cotton and cotton fabrics, D. Armstead (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 2 (1923), No. 10, pp. 104–108*).—This is a summary of the literature on the destructive effect of bacteria and fungi on cotton. A list of 15 literature references is appended.

METEOROLOGY.

Monthly Weather Review, [January-February, 1924] (*U. S. Mo. Weather Rev., 52 (1924), Nos. 1, pp. 69, pls. 11, figs. 23; 2, pp. 71–132, pls. 15, figs. 25*).—In addition to detailed summaries of meteorological, climatological, and seismological data and weather conditions for January and February, 1924, and bibliographical information, reprints, reviews, abstracts, and minor notes, these numbers contain the following contributions:

No. 1.—The Relations Between Free-air Temperatures and Wind Directions (illus.), by W. R. Gregg; A Preliminary Study of Precipitation in Relation to Winds and Temperature (illus.), by V. E. Jakl; Pilot-balloon Observations at San Juan, Porto Rico (illus.), by O. L. Fassig, W. R. Gregg, and W. C. Haines; The Balloon Project and What We Hope to Accomplish, by C. L. Meisinger; A Method for Locating the Decimal Point in Slide-rule Computation, by N. W. Haas; and Monthly Normals of Sea-level Pressure for the United States, Canada, Alaska, and the West Indies, by P. C. Day.

No. 2.—A Cruise with the International Ice Patrol (illus.), by R. DeC. Ward; Local Forecast Studies—Winter Precipitation (illus.), by T. A. Blair; A New Principle in the Analysis of Periodicities (illus.), by C. F. Marvin; Fitting Straight Lines to Data Greatly Simplified with Applications to Sunspot Epochs (illus.), by C. F. Marvin; On Krichewsky's Method of Fitting Frequency Curves (illus.), by E. W. Woolard; Comments on the Law of Pressure Ratios, by F. J. W. Whipple; Problems of the Lower Colorado River (illus.), by J. H. Gordon; Tidal Bore at Mouth of Colorado River December 8 to 10, 1923, by J. H. Gordon; Lee on Evaporation Loss from Water Surfaces; Moist Soils, with Special Reference to Conditions in Western America (illus.), by A. J. Henry; The Course Traveled by Wind and Weather in a Day—An Aid in Weather Forecasting, by C. Kassner, trans. by C. L. Meisinger; The Physical and Geological Traces of the Cyclone Belt Across North America (illus.), by

M. Manson; Determining Atmospheric Conditions of Comfort (illus.), by F. M. Phillips; The High-altitude Rocket, by R. H. Goddard; Bibliography of Dr. W. Dwight Pierce's Contributions on Meteorological Effects on Life; Waterspout and Tornado Within a Typhoon Area (illus.), by G. B. Barbour; and The Eye of the Storm, by D. Manning.

Climatological data for the United States by sections, [January-February, 1924] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 11 (1924), Nos. 1, pp. [197], pls. 4, figs. 2; 2, pp. [194], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for January and February, 1924.

Climatological data for the United States by sections, [1924] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 10 (1923), No. 13, pp. [234], pls. 23, figs. 8*).—This number summarizes the climatological data for each month of 1923 and for the year as a whole for each State.

Ohio weather for the year 1922, W. H. ALEXANDER and C. A. PATTON (*Ohio Sta. Bul. 373 (1923), pp. 68–78, figs. 3*).—Observations on temperature and precpitation at Wooster and other places in the State are briefly summarized in tables and diagrammatic maps.

The mean temperature for the year at the station was 51.3° F.; for the State, 52.8°. The highest temperature at the station was 96°, August 18; for the State, 101°, August 18. The lowest temperature at the station was −11°, January 25; for the State, −20°, January 25. The annual rainfall at the station was 34.42 in.; for the State, 37.04. The number of rainy days at the station was 123; for the State, 111. The prevailing direction of the wind for the State was southwest.

"Excepting the year 1921, the year 1922 was the warmest of record (1883–1922). . . . Although it was the second warmest year of record, frost occurred in every month in the year. The frost was light, of course, in June, July, August, and September. . . . Over practically the entire State the growing season for 1922, between the killing frosts of April 29 and 30 and October 13, was 166 or 167 days."

SOILS—FERTILIZERS.

Soil survey of Adams County, Wisconsin, W. J. GEIB ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+1121–1152, fig. 1, map 1*).—This survey, made in cooperation with the Wisconsin Geological and Natural History Survey and the University of Wisconsin, deals with the soils of an area of 428,800 acres lying a little south of the center of Wisconsin. Except for the glaciated southeastern corner, where the surface is undulating or rolling, the topography is that of a wide plain broken by scattered abrupt sandstone mounds or ridges and by extensive marshy tracts. The streams are said to have a rapid flow and drain the western and southern parts of the county quite thoroughly. The largest areas of undrained land are in the northeast corner and back of the moraine along the east side.

The soils vary in texture from very red clay to sand, the latter being very extensive. The soil materials have been accumulated by various agencies, including weathering from sandstone, wind action, transportation and mixing by glacial ice, and deposit from the waters of glacial Lake Wisconsin. Including peat and rough, stony land, 23 soil types of 10 series are mapped, of which the Plainfield sand and fine sand cover 44.7 and 10.8 per cent of the area, respectively.

Management of the light colored clay and silt loam soils, A. T. WIANCKO (*Indiana Sta. Circ. 115 (1924), pp. 20, figs. 5*).—Data and information are presented on the characteristic needs of the light-colored clay and silt loam soils of Indiana, and practical means and methods are suggested for making them more profitably productive.

Air drying of agricultural soils [trans. title], A. LEBEDIANTZEFF (*Compt Rend. Acad. Sci.* [*Paris*], *178* (*1924*), *No. 9, pp. 793–795*).—Studies are reported which showed the influence of air drying in increasing the fertility of different Russian soils as indicated by the yields of such crops as millet, maize, oats, wheat, beets, carrots, and potatoes.

Drying had a greater influence in increasing the fertility of humid prairie soils than of soils dried by cultivation and weeding. The effect of drying was particularly marked on virgin soils and was less noticeable on soils subjected to a regular system of cultivation for some time. Fertilization made the soils more sensitive to drying. The effect of drying varied with the depth in the same soil, being greatest in the intermediate layers and least in the surface and subsoils.

The increase in fertility varied with the degree of drying and with the number of successive wettings and dryings. The increase was marked when the moisture content was reduced to 6 per cent in cultivated and to 14 per cent in virgin soils. The maximum effect occurred after three dryings.

Some observations on the decomposition of organic matter in soils, R. L. STARKEY (*Soil Sci.*, *17* (*1924*), *No. 4, pp. 293–314, figs. 5*).—Studies conducted at the New Jersey Experiment Stations on the decomposition of cellulose, dextrose, rye straw, alfalfa meal, dried blood, and mixed spore and mycelium material of fungi in the same soil and in soils of different fertility, as indicated by carbon dioxid evolution, are reported.

The carbon dioxid evolved from decomposing organic matter was found to serve as a reliable index of the process of decomposition. The amount of decomposition of different organic materials at any one time varied in the same soil. Such decomposition was very rapid in fertile soils, and the differences in decomposition of the different materials were greatest during the first few days. In general, the period of maximum decomposition occurred during the first few days after adding the material to the soil.

The rate of decomposition of each organic material was distinctive, some decomposing rapidly from the start, others showing a decided lag in the early stages of decomposition, and still others showing a uniformly moderate decomposition. Cellulose decomposed most slowly, followed in order by rye straw, alfalfa meal, fungus material, and dried blood. Dextrose decomposed the most rapidly of all the materials used. Nitrate distinctly accelerated the decomposition of rye straw and cellulose, but had no effect when added to alfalfa meal.

Rye straw tended to deplete the soil of soluble nitrogen during the early stages of decomposition, alfalfa meal slightly increased it, and dried blood greatly increased it, particularly the ammonia. These effects are correlated with the nitrogen contents of the organic materials. The decomposition of the same material in soils of varying fertility was different, but the order of the soils with respect to the rapidity with which they decompose one organic material was not the same for another. Nearly neutral soils decomposed organic matter more rapidly than acid soils. The differences in production of carbon dioxid from the carbon contained in soils without further additions of organic matter were much greater than those produced in these same soils from added organic matter.

The effect of different kinds of wood and of wood pulp cellulose on plant growth, J. A. VILJOEN and E. B. FRED (*Soil Sci.*, *17* (*1924*), *No. 3, pp.*

199-211, figs. 5).—Laboratory and greenhouse studies conducted at the University of Wisconsin on the effect of different kinds of wood on the growth of oats and clover on virgin Colby silt loam soil obtained from a cut-over area are reported.

The results showed that the unfavorable action of wood on plant growth is due to a lack of nitrate in the soil. Since the same results were obtained with wood pulp cellulose as with wood, it is considered unlikely that there is any toxic action on the plant due to such wood constituents as essential oils, resins, and tannins. Certain kinds of wood, for example, alder or poplar, were more injurious than birch or willow, due probably to variation in rate of decomposition. The alder and poplar were decomposed more slowly than the other woods, and their injurious effect was noted for a longer time. It was also found that the lack of nitrate is due to a reduction rather than to an inhibition of nitrification, and that this reduction is caused by a group of organisms which make use of cellulose. With large amounts of blood meal in the soil the rate of nitrification could be so increased that it exceeded the rate of reduction, resulting in an accumulation of nitrate.

The results as a whole are taken to indicate that the reduced growth of plants following the application of young wood is closely connected with a loss of nitrates, and that this injury soon passes off and is almost without effect the following season.

The microsiphones of the soil [trans. title], G. Guittonneau (*Compt. Rend. Acad. Sci.* [*Paris*], *178* (*1924*), *No. 10, pp. 895-898*).—Studies of the growth and activities of microsiphones from garden and cultivated field soils are reported. These organisms are present in soils in great numbers in the fall and early winter, especially those containing large amounts of organic matter. They prefer a slightly alkaline reaction, but were found to function in acid soil having a pH value of 5.5.

It is concluded that these organisms, in addition to their symbiotic association with plants of soils containing much humus and to their parasitic activities, are capable of partaking extensively in the phenomena of soil biology, with particular reference to humus formation.

Microbiological analysis of soil as an index of soil fertility, VII, VIII, (*Soil Sci.*, *17* (*1924*) *Nos. 2, pp. 141-161, figs. 4; 4, pp. 275-291, fig. 1*).—In continuation of studies on the subject from the New Jersey Experiment Stations (E. S. R., 50, p. 517), two papers are presented.

VII. *Carbon dioxide evolution*, S. A. Waksman and R. L. Starkey.—It was found that the determination of the amount of carbon dioxid evolved from soils both with and without the addition of small amounts of organic matter can be used in grading these soils on the basis of their fertility as well as can be done by determinations of the numbers of microorganisms and nitrification in the soils. Soils rich in organic matter were found to produce the greatest amount of carbon dioxid, which is, however, not proportional to the carbon content of the soils. The addition of lime to an acid soil stimulated the production of carbon dioxid, but not to so great an extent as nitrification. Two methods of measuring the capacity of soils to produce carbon dioxid are suggested.

VIII. *Decomposition of cellulose*, S. A. Waksman and O. Heukelekian.—Studies are reported which indicated that the determination of the power of the soil to decompose cellulose can be added to the group of methods used for carrying out a microbiological analysis of the soil. It was found that for every milligram of nitrogen that is available or that can become available in a soil in a particular period of time, from 40 to 50 mg. of cellulose will be decomposed in a given amount of soil.

A study of the cellulose-decomposing power of the soil with and without the addition of a small amount of available nitrogen yielded information for the differentiation of soil fertility. Three methods of measuring the cellulose-decomposing power of soil are described, each one of which is said to yield information on the subject from a different viewpoint. The first method, or the determination of cellulose decomposition in untreated soil, yields information as to the available nitrogen. The second method, or the determination of the rapidity of cellulose decomposition in soil in the presence of available nitrogen, yields information on the physical and chemical condition of the soil bearing upon microbiological activities and soil fertility, in addition to the nitrogen factor. The third method, or the determination of the cellulose-decomposing capacity of the soil in the presence of calcium carbonate, potassium phosphate, and magnesium sulphate, yields information on that nitrogen which can become available when the soil is properly treated.

Some mutual effects on soil and plant induced by added solutes, J. S. Burd and J. C. Martin (*Calif. Sta. Tech. Paper 13 (1923), pp. 27, figs. 5*).—Experiments are reported in which two soils treated with various solutions and salt mixtures, when examined after eight months, showed substantial increases in water extractable constituents in general. In most cases the increase of a given constituent was less than the amount of solute added, but magnesium and sulphate in one of the soils increased more than could be accounted for by the addition of these elements. The changes induced are ascribed to added solutes, to chemical replacements of solid phase material, to fixation by the solid phase, and to increased solubility of solid material in the new soil solution.

Two soils upon which crops were grown received various treatments of sodium nitrate, sodium dihydrogen phosphate, and potassium chlorid. An increase of the added solute was always observed in water extracts of the soil in the early part of the season. Additions of nitrate, however, did not prevent the practical disappearance of this ion at the height of the growing season. A reciprocal relation between added phosphate and other solutes was made evident, there being diminished amounts of water-extractable calcium and magnesium in both soils and of potassium in one soil when the water-extractable phosphate was increased by treatment.

When no increase of crop was produced by treatment of the soil, a correlation was observed between the increases in given constituents in the soil as measured by water extraction and the withdrawals of such constituents by the plants. On the other hand, increased or diminished withdrawals were frequently observed which bore no apparent relation to increased or diminished amounts of water-extractable constituents. This result is ascribed to the defects of water extraction as a measure of the soil solution or to the influence of the changed concentrations of other constituents upon the absorption of a given element by the plant.

When an increase of crop was brought about by treatment of the soil, there was a definite correlation between withdrawals of some constituent or constituents and the yields of dry matter obtained. The amounts of other constituents withdrawn appeared to have been determined either by changed concentrations or by increased amounts of dry matter produced.

Soil biology [studies at the Pusa Research Institute], C. M. Hutchinson (*Agr. Research Inst., Pusa, Sci. Rpts., 1922–23, pp. 43–49, pl 1*).—Studies on nitrogen fixation in soil by nonsymbiotic organisms, continuing work previously noted (E. S. R., 49, p. 117), are summarized.

The data on the symbiotic relationship between algae and nitrogen-fixing soil organisms are said to have shown that large differences in fixation occurred as the result of the influence of light and darkness upon algal growth. Large differences were also noted in the suitability of various green manures and crop residues as sources of energy for nitrogen fixation by soil organisms. Fixation was greatly increased in some of these materials by the introduction of fermenting organisms in the form of a watery extract of cow manure. Previous fermentation of the organic residues considerably increased their apparent value as sources of energy for Azotobacter, and optimum periods of fermentation were established which varied with different materials. Nitrogen fixation was found to occur in cow dung alone and to be increased about 15 per cent by the addition of straw.

Fixation of nitrogen in pure cultures of Azotobacter was increased by small additions of nitrate. Larger amounts inhibited fixation completely and resulted in a reduction of the added nitrate, while artificial aeration increased the fixation and greatly increased the growth of Azotobacter. Indigenous rock phosphate had a distinctly depressing action on nitrogen fixation by Azotobacter in pure culture, while basic slag had a decidedly beneficial effect.

Nitrogen fixation was found to be active in river silt, and a vigorous growth of algae occurred in this medium in diffused daylight. More than double the quantity of nitrogen was fixed in the light than when the silt was kept in darkness, thus affording further evidence of the symbiotic relationship existing between the algal growth and that of the Azotobacter. The addition of mannite increased nitrogen fixation. Artificial aeration in culture solutions containing algae and Azotobacter was found to depress nitrogen fixation to a considerable extent.

Nitrification experiments showed that it is highly advantageous, when dealing with the problem of the use of organic manures and residues, to make use of the method of fermentation under controlled conditions.

Studies on the bacterial decomposition of cellulose are said to have led to the isolation of a specific organism capable of dissolving cellulose under aerobic conditions, but only in symbiosis with certain other soil bacteria, of which several were found. None of these secondary organisms had any capacity for cellulose destruction, either individually or in symbiosis with any other except the specific one first mentioned.

Studies on the solution of mineral phosphates showed that by the use of cultures of sulphur-oxidizing bacteria, these being watered into composts containing rock phosphate and sulphur, very great advances were made in the percentage of phosphate rendered soluble. Additions of gypsum to the sulphur-phosphate compost appeared to increase solubility by improving the physical texture of the mass with regard to aeration.

Data on green manuring are also included.

The relation of concentration of soil solution to nitric nitrogen in soils containing large quantities of available nitrogen, and [its] effect upon plant growth (*New Mexico Sta. Rpt. 1923, p. 20*).—In water and pot culture experiments with pop corn to determine the relative toxicity of different nitrates, analyses of leachings are said to have shown but little difference in the nitrate content of the soil between the checks and subplats receiving 100 lbs. and 500 lbs. of sodium nitrate per acre. Where 1,000 lbs. were applied there were some nitrate accumulation, while where 2,000 lbs. or over were applied there was a marked accumulation of nitrates in all cases.

Preliminary note on the distribution of nitrates in soil under corn culture, A. W. Blair and A. L. Prince (*Soil Sci., 17 (1924), No. 4, pp. 323–326*).—Studies conducted at the New Jersey Experiment Stations on the distribution of the nitrate content of soil in the vicinity of growing corn plants in a 5-year rotation of corn, oats, wheat, and timothy are reported. While no definite conclusions are drawn, there is said to be good reason to suspect a more complete utilization of the nitrates that are formed in the soil when the soil reaction is near the neutral point than when it is distinctly on the acid side.

The effect of certain fertilizers on nitrification, P. E. Brown and R. N. Gowda (*Jour. Amer. Soc. Agron., 16 (1924), No. 2, pp. 137–146*).—Studies conducted at the Iowa Experiment Station on the effects of manure, clover hay, and phosphatic and nitrogenous fertilizers on nitrification in Carrington loam soil in the greenhouse are reported.

Nitrification was increased by applications of manure up to the maximum treatment of 36 tons per acre. The increases from the larger applications were not proportional to the amount of the application. There was no indication of denitrification in soil receiving the largest amount of manure. Rock and acid phosphates and sodium nitrate increased the nitrate content and the nitrifying power of the soil. Clover hay had a slight effect on the nitrate content of the soil but increased its nitrifying power. Small applications of a 2–8–2 complete fertilizer increased the nitrate content of the soil and slightly stimulated the nitrifying power.

It was found that periods of intensive nitrification seemed to alternate with periods of lesser action, the length of these periods and the time of their occurrence varying with the treatment of the soil.

Soil variability as determined by statistical methods, A. H. Post (*Soil Sci., 17 (1924), No. 4, pp. 343–357, figs. 4*).—Studies conducted at the Washington College to determine the variability of nitrogen in the soil are reported.

It was found that soil plats that appear fairly uniform may show a large variation in nitrogen content among samples. The application of manure to the soil increased its variability with reference to nitrogen content. Due to soil variability, statistical constants calculated for one area were not comparable with any other. This is taken to indicate that the use of a single sample is of very little value for accuracy in experimental work, and that a composite sample is of value only after the soil variability has been determined. Then enough determinations should be made on the composite to insure a value representative of the soil mass.

It is concluded that to determine the field error in sampling any plat a fairly large number of samples should be taken, and statistical methods applied to the results. The field error determined in this way will be large or small according to the variability of the soil of the particular plat sampled. After the soil variability has been determined for any plat it is said to be possible to calculate the number of samples necessary to be within the limits of a certain error.

Sorghum as an indicator of available soil-nitrogen, R. M. Pinckney (*Soil Sci., 17 (1924), No. 4, pp. 315–321*).—Field studies by the Minnesota Experiment Station on the value of determining the hydrocyanic acid content of sorghum plants as an indicator of available nitrogen in soils are reported. Analyses for hydrocyanic acid were made 17, 55, and 88 days after seeding in the case of sorghum grown on plats in two productive fields, both without added nitrate and with various amounts applied shortly after the young plants appeared.

At the first stage the plants from all the plats contained a very high percentage of hydrocyanic acid, which was highest in those from the fertilized plats. At the second stage the plants on all the plats given nitrate were larger and of a darker green color than those on the unfertilized plats. They also carried a higher percentage and a larger amount per plant of hydrocyanic acid. At the third stage the effect of the added nitrate was still more marked both in the percentage of hydrocyanic acid and in the amount per plant.

These data showed that the percentage of hydrocyanic acid decreased from the first to the last stages, and that at all stages it was greater on the fertilized than on the unfertilized plats. The amount per plant on the unfertilized plats decreased from the first to the last stages, while on the fertilized plats it first increased and later decreased.

Since the percentage of hydrocyanic acid in the leaves usually leads to the same conclusion as that in the whole plants, it is considered sufficient sometimes to analyze only the leaves in the case of older plants.

The availability of potash in Hawaiian soils, W. T. McGeorge (*Hawaii. Sugar Planters' Sta., Agr. and Chem. Bul. 48 (1924), pp. 24, fig. 1*).—Soil analyses and field experiments on some of the sugar cane lands of the Hawaiian Islands are presented, showing that the majority of these soils do not respond to potash fertilization. Apparently the principal factor related to the availability of potash in these soils is the presence or absence of lime. There is also some indication of a greater availability of the potash in the clay types of soil. The solubility of silica appeared to have no influence upon the availability of the potash.

The results are taken to indicate that a plantation soil containing less than 0.02 per cent of potassium oxid soluble in 1 per cent citric acid will, with rare exceptions, respond to potash applications regardless of the lime content of the soil, while those soils containing from 0.02 to 0.03 per cent may be considered as deficient in available potash and will usually show a slight response, especially where the lime content is low. In addition, with few exceptions, soils containing more than 0.03 per cent of potassium oxid soluble in 1 per cent citric acid will not give profitable returns from potash applications.

A description of the method of analysis is appended.

The available state, J. A. Murray (*Soil Sci., 17 (1924), No. 4, pp. 359–371, figs. 2*).—Studies conducted at the University College, Reading, England, are reported which suggest that the amount of available phosphoric acid in soils may be found from the rate at which the amounts of increase produced by application of different quantities of water-soluble phosphates diminish. The amount so found in an Australian soil was about 11 lbs. per acre, and it is thought that this explains the effect of manure and accounts for the difference in the response of grass and root crops and for the failure of chemical analyses to determine the manurial requirements of soils with certainty.

The amount of available phosphoric acid found in an English meadow soil was about 20 lbs. per acre on the average of 4 years' trial. Much the same results were obtained in wet and dry seasons, and they were not affected to any considerable extent by the application of nitrogenous manures. Evidence of the residual effects of the manure applied in preceding years was obtained in the third and fourth year.

It is pointed out that water-soluble phosphates revert to insoluble forms by reaction with other soil constituents, and that the rate at which they are redissolved must depend largely upon the size of the solid particles formed, in which there must be a critical stage. It is considered that only the phosphoric acid in solution is actually available to plants, and that the amount of phosphates found by this method would be more accurately described as superfine phosphates.

The loss of calcium carbonate in drainage water as affected by different chemical fertilizers, F. W. Morse (*Soil Sci., 17 (1924), No. 3, pp. 249–254*).—Studies conducted at the Massachusetts Experiment Station are reported, in which drainage waters from soils treated with three typical combinations of chemical fertilizers were analyzed for calcium at different seasons of the year. The amount of calcium carbonate removed from the soil where ammonium sulphate was used was more than twice as large as that with sodium nitrate. Sodium nitrate added to an application of dissolved phosphate and potassium chlorid protected the calcium carbonate somewhat. The results obtained with drainage waters were corroborated by the determination of the residual calcium carbonate in the soils of the plats.

[Soil fertility studies at the Iowa Station] (*Iowa Sta. Rpt. 1923, pp. 17–22*).—Data from 94 soil experimental fields and from greenhouse experiments on different soil types to obtain indications of fertility requirements are briefly summarized, together with data on the testing of soils for acidity and on methods of applying fertilizers.

[Soil fertility studies at the Wisconsin Station] (*Wisconsin Sta. Bul. 362 (1924), pp. 20–25, figs. 2*).—Fertilizer experiments with peat areas are briefly reported, indicating that good results may be expected from fertilizers on these soils. Tillage trials over a series of years at the Marshfield Substation are said to indicate that deep tillage and subsoiling do not pay on the staple crops. On a 5-year average, corn gave the best yields on spring plowed land, followed by ordinary fall plowing to a depth of from 6 to 7 in. Nine-year tests with oats showed a trifle higher yield on spring plowed than on ordinary fall plowed land. Likewise deep tilling gave the lowest yield.

Tillage trials at the Ashland Substation showed that the use of a deep tilling machine is unprofitable, but that the use of a subsoil plow shows some improvement over 6-in. fall plowing, especially on rutabagas. This is taken to indicate that deep stirring of the soil is beneficial for root crops. Shallow plowing has been found to be poor practice, and in general plowing to a depth of about 7 to 7.5 in. in the fall is recommended for red clay soils.

Fertilizer experiments on light sandy loam soils distributed over 23 plats in a rotation of potatoes, oats, and clover have indicated that the oat crop shows about a 50 per cent increase where green manuring crops of various kinds are plowed under. The potato and clover crops have also been increased by green manuring. In general, top-dressing is more satisfactory than plowing under of manure on these soils.

Fertilizer experiments at the Marshfield Substation showed that rock phosphate made a better showing on silt loam than formerly owing to the increasing amount of organic matter in the soil. Under such circumstances rock phosphate gave better results than acid phosphate with oats, but the reverse was true with barley. The use of gypsum in the growing of clover and other crops apparently does not pay. Potash fertilizer applied with stable manure did not give any satisfactory results during a 2-year period.

Fertilizer experiments on red clay soils with a rotation of corn, barley, oats, and clover demonstrated the value of applying manure at the rate of 10 tons per acre once in four years and of supplementing stable manure with acid phosphate, with special reference to such crops as corn and barley.

In drainage experiments on Colby silt loam, the results showed that during the first years after the seeding of alfalfa the crop was heaviest farthest away from the tile. In the third year a reversal took place, and the crop was heavier close to the tile. The potato crop was appreciably better at a greater distance from the tile than close to the drainage lines during the later years.

A project on the influence of rotation upon the maintenance of soil fertility, A. N. Hume (*South Dakota Sta. Rpt. 1923, pp. 10, 11*).—The progress results of this work are said to have indicated that wherever applications of phosphorus are made to wheat plats in the rotation earlier maturity of the plants is indicated. It is apparent that phosphorus is the limiting element in crop growth on these soils.

A summary of the fertilizer experiments [at the Ohio Station] (*Ohio Sta. Bul. 373 (1923), pp. 13–15, 19*).—Tabular data briefly summarizing the fertilizer experiments of the station with cereals, clover, and grass on 15 farms in 14 counties of Ohio are presented and discussed.

Fertilisers and soil amendments, W. J. Spafford (*Jour. Dept. Agr. So. Aust., 27 (1924), No. 8, pp. 741–765*).—A large amount of information on the selection and use of fertilizers and soil amendments on the soils of South Australia is presented.

Commercial fertilizers vs. stable manure (*Ohio Sta. Bul. 373 (1923), p. 31*).—The results of eight years' experiments on the use of manure at the rate of 4 tons per acre on corn in a 4-year rotation of corn, oats, wheat, and clover in comparison with an equivalent amount of plant nutrients in commercial fertilizers made up of sodium nitrate, acid phosphate, and potassium chlorid are briefly reported. The commercial fertilizers exceeded the manure in the value of increase in all cases, giving 24.3 per cent larger return in the case of the manure alone and 11.7 per cent when acid phosphate was added.

Shrinkage of manure (*Ohio Sta. Bul. 373 (1923), p. 30*).—Data on the shrinkage of flat piles of cow manure of 1,000 lbs. each placed out of doors and subjected to weathering from January to April each year for 10 years are briefly presented. The change in weight ranged from a gain of 5.1 per cent to a loss of 17.5 per cent, the average being a loss of 7.5 per cent. The spring weight is said to be mainly a matter of moisture and is not significant. The loss of the fertilizing constituents is more important. Determinations for five consecutive seasons of the total nitrogen, phosphorus, and potassium content of the fresh manure and of the same manure after three months' exposure indicated respective losses of 35.62, 22.49, and 51.06 per cent.

Nitrogen losses from composts, F. H. Smith (*Science, 59 (1924), No. 1522, pp. 213, 214*).—The results of studies conducted at the Georgia Experiment Station are briefly summarized, indicating the value of additions of powdered sulphur to compost mixtures in preventing the loss of nitrogen. It was found that the conserving action of the added material was due to sulphur oxidation rather than to retardation of ammonification.

Nitrogen, H. Hummel (*Der Stickstoff, Stuttgart: Eugen Ulmer, 1922, pp. 86*).—This is a handbook of information on the importance of nitrogen for the growth of plants; the history of nitrogen fertilizers; the production, composition, consumption, use, mixing, and application of nitrogenous fertilizers; and the specific requirements of different farm crops for nitrogen nutrition.

Nitrogen fixation, J. C. McLennan (*Canada Council Sci. and Indus. Research Bul. 11 (1924), pp. 28*).—A brief summary is given of the more important items involved in the nitrogen fixation industry.

Phosphate deposits in the Mansfield district, A. M. Howitt (*Victoria Geol. Survey Bul. 46 (1923), pp. 46, pls. 14, figs. 19*).—A description of the Mansfield phosphate deposits in Victoria is presented, together with chemical analyses of typical samples. The analyses indicate phosphoric acid contents as high as 20 per cent.

The effect of heat upon the availability of the phosphorus in basic phosphate rock, A. G. McCall and C. P. Wilhelm (*Maryland Sta. Bul. 260 (1923), pp. 103–120, figs. 3*).—Studies are reported which showed that, when measured by its citrate solubility, the phosphorus in Tennessee phosphatic limestone is slightly increased by burning at a temperature of 950° C. (1,742° F.) for 12 hours, but that when judged by the results obtained in field and pot tests, the availability to plants of the phosphorus in the calcined material is not high.

The raw untreated phosphate rock when used alone gave better results than even ten times the quantity of calcined phosphate. This is taken to indicate that the value of the latter can not be very great from an economic standpoint. Acid phosphate appeared to be far superior to the calcined material. It is considered evident that the commercial value of calcined phosphate as a source of phosphorus for agricultural purposes can not be great.

Availability of the phosphorus of floats as influenced by incorporation of farm manure in the soil, T. L. Lyon and H. O. Buckman (*Jour. Amer. Soc. Agron., 16 (1924), No. 2, pp. 96–103*).—Studies conducted at the New York Cornell Experiment Station are reported, in which nine crops were grown on field plats treated with graduated quantities of acid phosphate and floats. Acid phosphate was used to make sure that the soil responded to phosphorus. Certain of the plats were given a basic treatment of farm manure and others received sodium nitrate and potassium chlorid.

The application of floats to the plats treated with manure produced decidedly favorable increases in crops, which were larger and more significant than the increases obtained from the use of floats with a basic treatment of mineral fertilizers. Moreover, the yields from plats treated with manure increased with larger applications of floats, which was not the case on plats receiving mineral fertilizers as a basic treatment. These results are taken to indicate that the manure contributed markedly to the availability of the floats under the conditions of the experiment.

The manufacture of potash and other salts from leucite, J. W. Hinchley (*Jour. Soc. Chem. Indus., 43 (1924), No. 7, pp. 158–165, figs. 5*).—Some of the technical details in the processes involved in the manufacture of potash from leucite are briefly outlined, and attention is drawn to the value of powdered leucite as a fertilizer.

Liming New York soils, A. F. Gustafson (*N. Y. Agr. Col. (Cornell) Ext. Bul. 78 (1924), pp. 23, figs. 16*).—Practical information on the selection and use of liming materials, with particular reference to the requirements of New York soils, is presented.

Marls for liming soils, S. C. Jones (*Kentucky Sta. Circ. 32 (1924), pp. 12, figs. 3*).—A brief summary of the results from the use of lime and lime and phosphate in a 4-year rotation of corn, soy beans, wheat, and clover on six experiment fields in different parts of Kentucky are presented, together with general information on the selection and use of marls for liming of the soils of the State.

Activated sludge conserves city waste for fertilizer (*Wisconsin Sta. Bul. 362 (1924), pp. 17–19, figs. 3*).—The activated sludge process of sewage purification is briefly described, and data from experience on the use of this material as a fertilizer are briefly summarized. This fertilizer has been found to compare very favorably with other common forms of fertilizer, and excellent results have been obtained by using it in connection with such materials as rock phosphate and acid phosphate. Results with crops indicate that sludge has a very definite fertilizing value and is well adapted to crops having a long growing season such as corn and potatoes, especially on light textured soils such as the sandy loams.

The Beccari system of organic waste disposal (*Nation's Health, 5 (1923), No. 8, pp. 533–535, figs. 4*).—This system of cell fermentation of waste is described, and some of the results of its use are presented and discussed, with particular reference to the production of fertilizer material.

AGRICULTURAL BOTANY.

Does light affect the fertilizer requirements of plants? (*Wisconsin Sta. Bul. 362 (1924), pp. 52, 54*).—A preliminary account is given by G. T. Nightingale and E. J. Kraus of investigations conducted to determine the relation of light to the growth and chemical composition of horticultural plants. The authors reported that nitrates may be stored by the plant until the proper conditions arise for building up into other forms of nitrogen, and the presence of nitrates in the plants does not appear to affect materially the type of growth. Conditions resulting in a decrease of insoluble nitrogen and a still greater proportional decrease in carbohydrates resulted in a relatively high proportion of insoluble nitrogen to carbohydrates, producing a strongly vegetative and unfruitful plant. Conditions favoring an abundance of insoluble nitrogen and at the same time an abundance of carbohydrates resulted in a vigorously vegetative and fruitful plant. A decrease of available soluble nitrogen without simultaneously decreasing the carbohydrates supply resulted in a high proportion of carbohydrates to insoluble nitrogen and produced a weakly vegetative unfruitful plant. It is considered possible that certain forms of soluble nitrogen may be as intimately associated with the growth responses as are certain insoluble forms of nitrogen.

In the case of tomatoes, light within the limits of a 6-hour day did not appear to limit the building up of nitrates to insoluble forms of nitrogen, provided there was present an available supply of carbohydrates. Buckwheat, soy beans, radish, and the varieties of salvia used were limited in the building of nitrates to insoluble forms of nitrogen by a 7-hour day in the greenhouse, even though there was present an available supply of carbohydrates. A large decrease of carbohydrates in tomato plants already high in carbohydrates was apparently coupled with decomposition of insoluble nitrogen when this decrease was brought about by reduction in time of exposure of plants to light. New growth was produced even though there was no external supply of nitrates available to the plant. In the tomato, insoluble nitrogen was not decomposed to nitrates.

The effect of a direct electric current of very low intensity on the rate of growth of the coleoptile of barley, V. H. Blackman, A. T. Legg, and F. G. Gregory (*Roy. Soc. [London], Proc., Ser. B, 95 (1923), No. B 667, pp. 214–228, figs. 6*).—In order to test the direct effect of electric currents on the growth rate of actively developing organs, pure line barley seedlings were grown in darkness and measured quickly under weak red light. The current was obtained by means of the glow discharge from a metallic point at high voltage vertically above the coleoptile. The technique as finally employed is described.

"The rate of growth of the coleoptile (sheathed stem) of the barley seedling is increased when it is exposed for a period of one or three hours to an electric discharge from a point charged positively to about 10,000 volts (crest value), and placed at such a height (about 2 cm.) above the coleoptile that a current of the order of 0.5×10^{-10} ampere passes through it. The increase in the rate of growth reaches 4.65±1.19 per cent of the 'standard' rate (4 per cent of the normal rate) in the first hour, and if the current is continued for another two hours the effect goes on increasing, showing in the third hour an excess of 7.53±1.95 per cent of the 'standard' rate (5 per cent of the normal rate).

"When the current is stopped there is a very remarkable aftereffect, for the rate of growth continues to rise for at least four hours after the cessation of the discharge; this aftereffect is greater than the direct effect, and may result in the fifth hour in an increase in growth of 15.68±2.62 per cent of the 'standard' rate above that of the control plants (equivalent to 12.58 per cent of the actual rate of the control plants).

"The aftereffect, as measured by the increase in the rate of growth in the fifth hour from the start of the discharge, is greater with the short discharge period of one hour than with the longer discharge period of three hours.

"When the point is negatively charged and a current of the same intensity passed through the seedling for three hours the rate of growth increases during the first hour, but the increase, instead of becoming greater with time as with a current in the other direction, becomes less, so that in the third hour the rate is little, if at all, above the normal. When after three hours the current is stopped, an aftereffect, exhibiting itself as before in an increased rate of growth, is to be observed; the aftereffect for the two hours during which it was followed is markedly less than that shown when the current is in the other direction.

"Experimental evidence is advanced for the view that the gaseous products of the discharge and the 'electric wind' play little or no part in the stimulation of growth observed. The view that the current alone is of importance in the reaction is also supported by the fact that its direction exerts such a marked influence on the degree of stimulation."

Influence of reaction on inter-relations between the plant and its culture medium, J. J. Theron (*Calif. Univ. Pubs. Agr. Sci., 4 (1924), No. 14, pp. 413–444, figs. 12*).—In the investigation here described the object was to study the effect of various concentrations of H-ions on the external appearance and growth of plants, and the effect of the reaction on the metabolism of these plants.

The influence of the reaction of the culture medium on growth and metabolism was followed by growing typical common agricultural plants in solution cultures at different reactions. A technique was finally devised by which the reaction of the solution could be conveniently controlled. Particular attention was given to the constant maintenance of the desired H-ion concentration during the experimental periods. It was found that plants grown in solution cultures have an optimum growth reaction at pH 4.5 to 6.

"The reaction of the juice expressed from the tops of the plants was not influenced by the reaction of the culture medium, whereas the reaction of the juices expressed from the roots was modified considerably. The buffer effect of both the roots and the tops may be influenced by the reaction of the culture solution. In the tops the acid reserve is affected, and in the roots the alkali reserve. Observations were made on the ability of the growing plant to change the reaction of either acid or alkaline culture solutions.

"A study of the effect of the reaction of the solution on the absorption of the anions and cations by the plant is described. Several methods are outlined by which the plant changes the reaction of either acid or alkaline culture solutions toward neutrality. Absorption experiments show that the rate of absorption of the cations is increased by a decrease in the H-ion concentration, while the ability of the plant to excrete CO_2 from the roots allows of the selective absorption of anions from the acid solutions. The charge on the constituents of the root cells may be assumed to be of vital importance in the mechanism of absorption. The nitrogenous constituents of the cell sap are charged negatively, and the isoelectric points of the majority of ampholytes in the cell is below pH 4.5. Pea plants change the reaction of either acid or alkaline solutions from pH 6.65 to pH 6.7, whereas barley and corn plants change it from pH 6.75 to pH 6.8. The main factor involved in bringing about this reaction is the CO_2-HCO_3-equilibrium in the plant and in the solution."

Permeability, VI–XII, W. Stiles (*New Phytol., 21 (1922), Nos. 1, pp. 1–14, figs. 3; 2, pp. 49–57; 3, pp. 140–162; 4, pp. 169–209; 5, pp. 233–251, figs. 6; 22 (1923), Nos. 1, pp. 1–29; 2, pp. 72–94, figs. 2*).—This is a continuation of the series previously reported (E. S. R., 39, p. 223).

VI. *Osmotic pressure.*—The author outlines herein five methods for determining osmotic pressure, deferring to a later chapter the plasmolytic methods and the tissue tension method. Graphic and tabular data are presented, with discussion in regard to the relation of osmotic pressure to temperature and concentration; the osmotic pressure of sucrose, electrolytes, and colloids; theories of osmotic pressure; negative osmosis; and possible cases of electrification of membranes and the effects on osmosis. The importance, in connection with osmosis, of electrical phenomena associated with membranes is indicated.

VII. *The cell wall.*—From this review of the properties of cell walls with particular regard to permeability it appears clear that we may expect to find cell walls having very different degrees of permeability, both to water and to various solutes.

VIII. *The plasma-membrane.*—As regards the composition of the limiting membrane of the protoplasm, it is concluded that any view which regards the surface layer as composed exclusively of one kind of substance, either fatty or protein, must be dismissed at once. On theoretical grounds, and as a result of experimental work, it appears clear that the limiting layer of the cell must contain those constituents of the protoplasm and of the external liquid which lower the surface tension. These substances will thus constitute a colloidal complex, either a sol or gel, but how the molecules of the various constituents are arranged in reference to one another, present knowledge is insufficient to indicate.

It appears clear that the limiting membrane of the cell is not an invariable structure, but that it will vary with alterations in composition both of the external medium and the protoplasm. The view is regarded as completely untenable that the plasma membranes are permanent structures arising only from preexisting membranes. Nor is it possible to separate the limiting membrane from the rest of the protoplasm, as it depends for its existence on the media which it separates, is closely related to these, and presumably passes over into the two phases on either side of it, gradually in some cases, more or less sharply in others, according to the composition of the protoplasm and the external medium. Other cell membranes are briefly discussed.

IX. *The water relations of the plant cell.*—This deals with such matters as osmosis and its consequences, exudation and root pressure, water relations of the cell wall and protoplasm, the effect of permeability of the protoplasm and of imperfect premeability of the cell wall to solutes on the water relations, and of tissue tensions on the water relations of cells inclosed in tissues.

X. *The influence of external conditions on the intake and excretion of water by plant cells and tissues.*—Data are detailed and discussed in regard to temperature and dissolved substances (sucrose; sodium chlorid; ethyl alcohol, octyl alcohol, chloroform, and mercuric cyanid; sulphuric acid, osmic acid, and mercuric chlorid; and ethyl acetate and phenols).

XI. *The determination of the permeability of plant cells to dissolved substances.*—From what has been said (E. S. R., 39, p. 223) of the permeability of membranes, "we may expect the permeability of the same cell to differ exceedingly toward different solutes. We may also expect that the order of permeability to a series of substances may differ in the case of different cells.

Also as cells differ so much in their structure and properties, we may expect that methods applicable for the determination of the permeability of some kinds of cells may not be applicable in the case of others. This is indeed the case, as will be very evident from a consideration of the various methods." These methods are described.

From this survey it is deemed obvious that reliable data are often readily obtainable with regard to qualitative relations in permeability, but that although many results have been recorded professing to give quantitative data with regard to intake of dissolved substances and the permeability of cells to such substances, in most cases the presence of disturbing factors renders the results open to criticism.

XII. *Quantitative relations in the penetration of dissolved substances into plant cells.*—Various aspects of the quantitative relations of plant cells are dealt with in the several sections of this chapter, giving information, so far as available, that appears necessary to formulate the laws relative to the passage of substances into and out of the cells, the data being presented with discussion, largely as drawn from reports of work by several persons named.

Further observations upon the mechanism of root pressure, J. H. Priestley (*New Phytol., 21 (1922), No. 1, pp. 41-47*).—Since the publication of a paper previously noted and criticized by Blackman (E. S. R., 46, p. 431) the author has continued the experimental study of exudation pressures, and considers desirable a brief restatement of the main principles involved in the original hypothesis.

The mechanism previously suggested requires the fulfillment of certain structural and physiological conditions if an adequate exudation pressure is to be maintained in the xylem vessels of the root. These are a continuous chain of protoplasts with living semipermeable membranes, permitting of the movement of water inward to the protoplasts adjoining the xylem vessel by the ordinary process of osmosis; a continuous supply of solutes to the xylem vessel to replace those carried upward by the ascending column of sap; and an endodermis in which the network of Casparian strip forms a rigid framework preventing too much extension of the tightly packed protoplasts within the endodermal cylinder and prevents leakage of the sap, and, therefore, of the solutes, from the xylem through the walls intervening between the protoplasts. As the protoplasts of the endodermis are themselves relatively impermeable this structural peculiarity of the endodermis renders practically negligible the loss of solutes from the xylem into the cortex. On all these features of the mechanism a few comments are added, applying mainly to osmosis and water absorption, the supply of solutes, and the structure of the endodermis.

The fundamental fat metabolism of the plant, J. H. Priestley (*New Phytol., 23 (1924), No. 1, pp. 1-19*).—Intended as the introduction to a series of investigations concerned chiefly with fat metabolism in the plant, the present paper, which was written before that by R. M. Tupper-Carey and Priestley (E. S. R., 51, p. 330), in which some of the results of these investigations appear, contains the statement, as simple and full as possible, of the chemical and physiological side of the problem, in the hope that chemists and botanists may help toward a solution.

It is the object of this account to review the data available as to fat metabolism within the plant in the effort to establish the existence of a similar metabolism which is inseparable from the growth of the living plant. It is in this sense, and in contradistinction to the metabolism associated with the formation and utilization of temporary reserves of fat, that the phrase fundamental fat metabolism is employed to denote that metabolism of fatty substance which must be one of the fundamental conditions associated with growth. In order to follow the rôle of fats within the plant, the attempt was made to define the different types of compound involved and to explain their main chemical characteristics. Discussion from a chemical standpoint is also given of terms.

"Fats, notably the fatty acids, are utilized in various ways during tissue differentiation, and it is probable that many of these processes are as yet unrecognized. . . .

"In all cells the fats appear to migrate outwards and to find their way in large part on to the cell membrane. The exact extent to which they are held in the membrane depends upon various factors, among which the most important external one appears to be the $\frac{Ca}{K.Na}$ ratio in the inorganic salts supplied to the plant. . . . The phloem, because of its alkaline, reaction, appears to free itself completely from fat within the membrane, though at various times fats will be detected in the contents. . . . In the xylem, the fats have also deposited in part in the wall, but the xylem during differentiation is notably acid in reaction and appears to lose mainly its basic constituents. . . . As the fatty acids migrate outwards from the differentiating tissue, they are carried with the movements of the sap along the wall of the surrounding tissues. . . .

"Wherever the fatty acids may finally deposit, in cuticle or cork layer, in exodermis or endodermis, their subsequent fate seems to be the same. The unsaturated acids undergo oxidation and condensation, and the general result is the formation of a relatively waterproof layer, the fatty constituents of which have mainly lost their power of dissolving in fatty solvent and are changed in the same general way as are the oils in the industrial processes."

GENETICS.

The present position of Darwinism (*Nature* [*London*], *110* (*1922*), *No. 2770, pp. 751–753*).—A discussion held during the British Association meeting at Hull by the botanical and zoological sections jointly, the participants including H. H. Dixon, J. C. Willis, G. U. Yule, C. T. Regan, W. Johannsen, J. T. Cunningham, H. Wager, E. B. Poulton, C. Mitchell, A. C. Seward, J. Huxley, R. R. Gates, W. J. Dakin, A. B. Rendle, and J. S. Gardiner.

A new mutation in Triticum durum and its importance for the phylogenetics of wheat [trans. title], S. Lewicki (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém. Inst. Natl. Polonais Écon. Rurale Pulawy*), *3* (*1922*), *A, pp. 61–82, pl. 1*).—A mutation of a pure line of *T. durum coerulescens* found by the author is characterized by fragility of the spike and by pubescence at the base of the spikelets, i. e., by characters of the species *T. dicoccoides*, the hypothetical ancestor of wheats. The leaves correspond to the durum type in respect to color and form, the culm is totally filled with pith, and the kernels are covered closely by the glumes. This mutation is said to approach more closely to *T. dicoccoides* and *T. durum* than to *T. dicoccum*.

The literature of analogous mutations is reviewed, with discussion of the origin of mutations and the relation of the mutation studied to the contemporary theories of the phylogeny of wheat.

The third-chromosome group of mutant characters of Drosophila melanogaster, C. B. Bridges and T. H. Morgan (*Carnegie Inst. Wash. Pub. 327* (*1923*), *pp. X+251, pls. 3, figs. 37*).—This is a monograph of the mutations of *D. melanogaster* which have been found due to genes located in the third pair of chromosomes. Included in the information given are the history of the discovery, description, symbol, and hereditary behavior of each mutant, with data on which the conclusions as to the location, interaction with other factors, etc., are based. An estimate of the value and reliability of each character for use in further investigational work is also valuable information which is furnished. Diagrams or colored illustrations of most of the mutants are also included, as well as a very extensive bibliography.

Some observations on the inheritance of white color in canaries [trans. title], H. DUNCKER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 32 (1924), No. 4, pp. 363–376*).—The hereditary behavior of white feather color as observed in a female canary having black eyes, a little black pigment on the head, and some yellow on the wing and shoulder has been studied. This female was mated with a yellow male in 1918, and the offspring were mated from 1919 to 1921. During 1922 there were seven matings of white × white birds with the production of 8 white and 4 yellow offspring, or an average of 1.7 per mating; 15 matings of white × yellow birds with the production of 18 white and 19 yellow, or an average of 2.47 young per mating; and 86 matings of yellow × yellow with the production of 199 yellows, or an average of 2.3 per mating.

From these results the author concludes that the factor for white feather color is dominant to the normal yellow. Since the litters produced by white × white were significantly smaller than those produced in other matings, and since the ratios of young were 2 white to 1 yellow, it is concluded that white in the homozygous condition is lethal and white birds are therefore all heterozygous.

Inheritance of petal spot in Pima cotton, T. H. KEARNEY (*Jour. Agr. Research* [*U. S.*], *27 (1924), No. 7, pp. 491–512, pl. 1*).—A conspicuous red spot near the base of the petal characterizes Sea Island and Egyptian cottons, while the petals of most upland varieties are spotless. In a hybrid between Holdon upland cotton and Pima Egyptian (E. S. R., 50, p. 24) this character showed unifactorial segregation, the ratio of spotted to spotless plants in F_2 being about 3 : 1. Two plants discovered in 1917 in a field of Pima cotton at Sacaton, Ariz., gave rise to families breeding true for a spotless or very faintly spotted petal.

Observations on several generations of crosses between these families and an inbred family in which the spot is fully developed gave conclusive proof that the spotless or very faintly spotted condition is a simple recessive. Full spotted, however, is not completely dominant, and the heterozygotes are partly distinguishable. The existence of modifiers is not apparent. The degree of expression of the petal spot was found correlated positively and significantly with size of flower in both spotted and spotless populations. However, no evidence of linkage appeared. The spot is affected by the environment, being responsive to soil variations and to seasonal changes. There is an entire absence of linkage between spotless petal and a relatively high mean number of boll-locks, and the spotless condition has been observed only in the two families described.

The possession of such a character as spotless petal by an agriculturally valuable strain of Pima cotton is considered of use in protecting the purity of the seed by making it easy to detect the offspring of accidental cross-pollinations with other strains. Since this character behaves as a simple Mendelian recessive, it probably can be transferred without great difficulty to any desirable strain of Pima cotton.

The inheritance of fertility and hatchability in poultry, F. A. HAYS and R. SANBORN (*Massachusetts Sta. Tech. Bul. 6 (1924), pp. 19–42*).—This study consists of a series of correlation tables, based on the fertility and hatchability of the fertile eggs in the pedigreed Rhode Island Red flock from 1913 to 1923. The following coefficients of correlations were determined: Fertility with hatchability 0.0672±0.0244; fertility and hatchability of eggs laid the first year with the fertility and hatchability of eggs laid the second year 0.2733±0.392 and 0.4346±0.0344, respectively; fertility and hatchability of the first year's eggs of mothers with the first year's eggs of their daughters 0.0147±0.0237 and 0.1960±0.0228; fertility and hatchability of the eggs laid by the first year daughters of sires with the eggs laid by the second year daughters of sires 0.2151±0.0901 and 0.2996±0.0860; fertility and hatchability of the eggs laid by the sires' dams with the eggs laid by sires' mates —0.1890±0.0254 and 0.1579±0.0259; fertility and hatchability of the eggs of sires' mates with the eggs of sires' daughters 0.0244±0.0332 and 0.2268±0.0315; fertility and hatchability of the eggs of sires' dams with the eggs of sires' daughters —0.0501±0.0246 and 0.0588±0.0246; and fertility and hatchability of the eggs laid by mates of sires with the eggs laid by mates of sons of the sires 0.0685±0.0515 and 0.0755±0.0514, respectively.

The yearly averages for fertility and hatchability are tabulated, and from that it is concluded that fertility is dependent largely upon environmental rather than genetic factors. Hatchability, however, seems to be less subject to environmental influences of the parent. The influence of the sire on the hatchability was definitely demonstrated by the correlation coefficients, and by the fact that the eggs of the same hens showed different fertility and hatchability when mated with different males. There is concluded from the study to be a genetic factor H responsible for high hatchability, which is cumulative in its action, HH eggs having a hatchability above 85 per cent, Hh eggs having a hatchability of 55 to 84 per cent, and hh eggs having a hatchability of less than 55 per cent.

Twinning in Brahma cattle, J. L. Lush (*Jour. Heredity, 15 (1924), No. 1, pp. 25–27, figs. 2*).—Two cases of twinning in cattle which were from ⅝ to ⅞ Brahman blood are described. In one case the twins consisted of two bulls, which from appearances were identical. In the other case the twins consisted of a heifer and a bull. The heifer looked much like a steer about the head and neck and had never had a calf at 5 years of age. The author therefore concludes that this is probably a freemartin and may indicate the occurrence of freemartins in Brahman (Zebu) cattle.

Linkage of Dutch, English, and Angora in rabbits, W. E. Castle (*Natl. Acad. Sci. Proc., 10 (1924), No. 3, pp. 107, 108*).—The author has previously reported the occurrence of very close linkage of the factors determining the English and Dutch patterns of rabbits, less than 1 per cent of crossing-over having been observed. In later experiments at the Bussey Institution, the English pattern has been found to be linked with the factor for Angora coat, about 12 per cent of crossing-over occurring. To verify these results, an experiment to establish the linkage relations between Dutch and Angora was carried on. The indicated crossovers, based on 68 individuals, were 10.3 per cent. This is very close to the observed crossing-over between English and Angora, and thus confirms the assumption of linkage between these three factors, which is very close between Angora and English.

Sex-determination and related problems, J. S. Huxley (*Med. Sci., Abs. and Rev., 10 (1924), No. 2, pp. 91–124*).—This is a brief review of the theoretical explanations of sex determination in animals, insects, and dioecious plants. A complete bibliography is also appended.

Inheritance of the crinkly, ramose, and brachytic characters of maize in hybrids with teosinte, J. H. Kempton (*Jour. Agr. Research [U. S.], 27 (1924), No. 8, pp. 537–596, pls. 8, figs. 106*).—The present contribution from the Bureau of Plant Industry, U. S. D. A., describes the inheritance of three Mendelian characters of maize, crinkly, ramose, and brachytic, in hybrids with the annual teosinte, *Euchlaena mexicana*. As in hybrids with normal maize, all three variations are recessive in the hybrid with teosinte. Crinkly and ramose reappeared in the F_2 in the expected monohybrid percentage of 25, but brachytic in only 12 per cent of the plants.

The several characteristics of the crinkly variation were found to be correlated among themselves, although in some cases the degree of correlation was low. The teosintelike plants with ramose inflorescences, while apparently functioning normally with respect to production of male gametes, were practically sterile as to production of female gametes. Fertile seeds, however, were matured by the ramose plants that were most maizelike with respect to other characters. The combination of the teosinte form of pistillate inflorescence with the branched condition of ramose was completely sterile. All three characters, crinkly, ramose, and brachytic, were found to be correlated with other characters of maize not involved in the changes from normal to crinkly, to ramose inflorescences, and to brachytic culms, respectively, but in many cases the characters involved differ in the three hybrids. Evidence seems to exist of a correlated complex of maize characters tending to reappear in the perjugate generations of hybrids with teosinte.

The close relationship of maize and teosinte seems to be further emphasized by these hybrids, and, with the exception of the ramose type of branching, there is little evidence of incompatible combinations. On the other hand, the cross with brachytic maize indicates that teosinte possesses modifying factors for this character not present in many maize varieties. The branching of the ramose variation, which would seem to represent a reversion to a more primitive form, does not approximate the branched inflorescence of teosinte but appears farther removed from teosinte than from normal maize. There seems to be practically complete freedom of recombination within the limits of physiological relationships as concerns the correlations among the characters differentiating maize and teosinte, but not involved in the change from normal maize to the three variations studied.

The artificial hybridisation of grasses, T. J. Jenkin (*Welsh Plant Breeding Sta., Aberystwyth*, [*Bul.*], *Ser. II, No. 2* (*1924*), *pp. 18*).—The technique employed at Aberystwyth, Wales, in making the artificial hybridization of grasses is detailed, with a statement of the results obtained in 1921, 1922, and 1923.

Success as measured by the percentage of heavy seeds produced was obtained with intraspecific crosses within *Lolium perenne*, *L. multiflorum*, *Festuca rubra*, *F. ovina*, *Arrhenatherum elatius*, *Dactylis glomerata*, *Phleum pratense*, and *Alopecurus pratensis*. Good results were obtained with *L. perenne*×*L. multiflorum* and its reciprocal. None of the seed set by *L. temulentum*×*L. perenne* germinated. Viable plants were obtained from *L. perenne* ×*F. rubra*, while neither of the seed from its reciprocal germinated.

L. perenne×*F. elatior arundinacea* gave rise to seed-producing plants much more similar to *F. elatior arundinacea* than to *L. perenne*. Although the development of the caryopses in the reciprocal were better, none of the seeds germinated.

Results from *L. perenne*×*F. elatior pratensis* were very poor, whereas the reciprocal produced several good plants, resembling Festuca more than Lolium. *F. loliacea*×*L. perenne*, *F. loliacea*×*F. elatior pratensis*, *L. perenne*×*D. glomerata*, and *L. perenne*×*Arrhenatherum elatius* all resulted negatively. Although none of the seeds from *F. elatior arundinacea*×*F. rubra* germinated, several plants with resemblance to *F. rubra* were obtained from the reciprocal.

The rare hybrid: Triticum polonicum eucompactum×T. monococcum flavescens [trans. title], S. LEWICKI (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém. Inst. Natl. Polonais Écon. Rurale Pulawy*), *3* (*1922*), *A, pp. 343–356, pl. 1, fig. 1*).—F_1 plants derived from the above cross were all sterile. The hybrids were intermediate between the parents as to stooling and length of glume. In length of straw and of spikes and in number of spikelets, however, the hybrids surpassed the parent forms, apparently showing a typical example of heterosis.

Since five of seven known species of wheat, notably *T. dicoccum*, *T. durum*, *T. turgidum*, *T. vulgare*, and *T. polonicum*, in crosses with *T. monococcum*, give hybrids that are entirely sterile, the latter species could be considered as the most remote and the most isolated in the phylogenetic order of the genus. Behavior in crosses with *T. vulgare* and *T. polonicum* suggests *T. monococcum* to be the oldest form in the phylogenetic rank of the genus.

Effect of first generation hybrids upon yield of corn, L. R. WALDRON (*North Dakota Sta. Bul. 177* (*1924*), *pp. 16, figs. 2*).—The yields and agronomic qualities of F_1 corn hybrids were compared with those of the parent varieties. Rustler, a white dent variety, was used as the pollen parent on dents, flints, and flour types.

The hybrids obtained from crossing Rustler with Mercer, Manitoba, and Mandan King, flint varieties, and with Flour corn averaged 18.7, 16.2, 14.5, and 11.3 per cent, respectively, higher in yield than their better yielding parent varieties during three years. Such a marked increase in yield is held of enough economic importance to warrant the production of hybrid seed for field planting. The hybrid strains were not found to be appreciably earlier than the average of their two parents; however, increased yield of hybrids did not seem to delay maturity. The hybrids were generally taller than the average of the two parents, that of Rustler×Mercer exceeding the tallest (Mercer) parent. Hybrid plants showed an amount of suckering surpassing the average of the parent plants when a comparison was made between plants grown individually in hills.

Detasseling enough plants to produce 6.12 bu. of corn required 8.75 hours, resulting in a cost of 65 cts. per bushel. The increased cost per acre of seed would be 11 cts. which would bring in an increased return estimated to be nearly $1.88 per acre.

A study of correlations between certain physical characters of plants and their capacity for yield, A. N. HUME (*South Dakota Sta. Rpt. 1923, pp. 11, 12*).—Further observations (E. S. R., 49, p. 527) gave indications that the immediate progeny of Marquis wheat also made a higher yield from long spikes than from relatively short spikes, but that this correlation did not persist. Marquis wheat appears to be a pure line so far as is indicated by yield, and selection for yield apparently can not be directly correlated with the physical appearance of length of spike.

Laboratory directions for an elementary course in genetics, H. T. MORGAN, H. J. MULLER, A. H. STURTEVANT, and C. B. BRIDGES (*New York: Henry Holt & Co., 1923, pp. 16*).—This pamphlet gives brief directions for conducting several elementary genetic experiments with *Drosophila melanogaster*.

FIELD CROPS.

[Agronomic investigations in Iowa, 1923] (*Iowa Sta. Rpt. 1923, pp. 11–14, 35, 36, 37*).—The behavior and characteristics of Iobred, a hardy winter wheat, Iogren oats, and Iodent corn are commented on as heretofore (E. S. R., 49, p. 732). Results thus far secured indicate that a number of legumes such as mungo beans, velvet beans, cowpeas, soy beans, and Dalea, and an early strain of lespedeza can be used successfully to improve the distinctly acid soils found in the State. The early lespedeza promises to be of great value on the poorer acid soils of the State for pasture and to prevent soil erosion. This legume makes an unusually heavy, strong root growth, and the plant is very drought resistant. On acid soils where the ordinary clovers do not thrive, soy beans may be seeded with small grain to provide subsequently a green manure crop. *D. alopecuroides*, an annual legume native to the Corn Belt and characterized by abundant seed production, gave indications of growing well on distinctly acid soils. Field tests suggest that Dalea is not well suited to the rich black loam soil of the State, but that it may have considerable value as a green manure on the lighter soils where Hubam, the other comparable annual legume, does not thrive.

A study of the hard seeds of white sweet clover suggested that the low winter temperature opens up the seeds. Seeds that had been scarified did not become hard again during storage.

In observations on the effect of weeds upon crop production, a mixed culture, one containing weeds and cereals growing under the same conditions, was found to transpire more moisture than a culture containing a cereal crop alone. Since a mixed culture reaches its maximum transpiration period later than a pure culture, and as there is no material difference in the ripening period, the time interval necessary for the formation of the grain or fruit appears to be shortened. In germination tests of weed seeds buried 4 ft. below the surface, velvet weed, jimson weed, and horse nettle showed continuance of vitality for 11 years each, five finger 10, curled dock and coffee bean tree 9, tumbling pigweed 8, burdock and catnip 7, lamb's quarters 6, and field thistle, quack grass, Dalea, evening primrose, and green foxtail 5 years.

[Field crops work in New Mexico] (*New Mexico Sta. Rpt. 1923, pp. 12, 13, 20–24*).—Experiments reported on in continuation with previous work (E. S. R., 49, p. 525) include variety trials with spring and winter wheat, barley, and oats, corn, cotton, alfalfa, and sugar beets; spacing trials with corn; and time of planting tests with sugar beets. The greater rhizome growth on plants of Johnson grass having the more stem and leaf growth indicated the value of pasturing and mowing as control measures. The maximum sugar content in sugar beets was generally attained during late August or September. Analyses showed the smaller beets to have the higher sugar contents. Sugar beets planted in September and October, 1922, produced seed in 1923. Neither fall nor early spring irrigations seemed to give any increase in alfalfa yields.

[Field crops work in Ohio] (*Ohio Sta. Bul. 373 (1923), pp. 16–18, 19–30, 41, 42, 48, fig. 1*).—Variety tests with corn, wheat, oats, rye, and soy beans at the station and the district and county experiment farms are summarized. Comparisons in 1923 in different counties show Trumbull and Gladden wheats, pure line selections from Fultz and Gypsy, respectively, to produce average increases over ordinary local varieties of from 0.2 to 8 bu. per acre, averaging 3.1 bu.

Wheat on oat stubble plowed August 1 averaged 35.2 bu., while that on land plowed September 15 made 30.2 bu. Plowing of oat stubble ground for wheat was superior to several diskings, even with equally good surface preparation. Eight-in. drilling has slightly exceeded 4-in. drilling in the production of wheat during eight years, and with oats 8-in. drilling led by a still larger margin. A 10-pk. rate and dates from September 25, October 5, and October 15 have given highest average returns with wheat during seven years. Fall seeding of 10 lbs. of timothy with wheat seems to have reduced the yield of wheat about 3 bu. per acre during three years. The average yields of oats seeded on corn stubble either disked or plowed were practically equal, whereas the grain yields were about 5 bu. less per acre on unprepared land. In seasons when white top, *Erigeron annus*, was bad the plowed land was much freer from weeds and produced larger yields than the disked land or land without preparation. In a comparison of late fall plowing with spring plowing of 1-year-old clover sod for corn, the average corn yields have been almost identical.

Huron timothy, a selection developed in cooperation with the U. S. Department of Agriculture, is comparatively late, blooming and maturing about six days later than ordinary timothy. In most of the tests including it at the Timothy Breeding Station at Elyria, Huron yielded more hay than ordinary timothy. Where alfalfa and orchard grass were seeded in mixture in 1915, the plats are free from Kentucky blue grass and Canada blue grass, although in near-by plats where alfalfa is growing alone both of these grasses have encroached. Strains of common and Grimm alfalfa were compared at Wooster in production and seeding tests.

In the two years tested, Ohio potato seed has compared favorably with that brought from the North and yielded as well the second year as the first. The highest yields were secured by the earlier planted potatoes (May 24–June 2), although the early planted potatoes were rougher than the late planted ones. Profitable increases followed the late application of Bordeaux mixture to June-planted Rural Russet potatoes.

In an account of the progress of rotations including the leading farm crops of the State, the 3-year rotation, viz, corn, wheat, clover, appears to be the most profitable of the regular cereal rotations, and, similarly, the 3-year rotation, potatoes, wheat, clover, seems to be the most profitable of the potato rotations.

[Field crops experiments in Wisconsin, 1922–23] (*Wisconsin Sta. Bul. 362 (1924), pp. 26–42, 75, 77, 78, 109, 110, figs. 12*).—Agronomic investigations are reported on in continuation of previous work (E. S. R., 49, p. 629, 630). Breeding work has developed improved varieties of soy beans, sweet corn, winter wheat, barley, oats, canning peas, and a cold-resistant corn.

Alfalfa has been grown successfully on Plainfield sand at Hancock, practices approved for the conditions including liming, inoculation, top-dressing with manure, and seeding without a nurse crop, preferably early. In sandy fields certain indvidual plants of alfalfa were less affected by drought than others because of deeper rooting. Areas of red clover top-dressed with manure and rock phosphate and limed were decidedly superior to those receiving lime only. Due to the vigorous root system and deep soil penetration, alfalfa seedings appeared to survive drought conditions at the station better than those of clover and timothy. Varieties cut three times in the bud stage have averaged 1.8 tons, three times in $\frac{1}{10}$ bloom 2.7 tons, and twice in full bloom 3.5 tons per acre. Late summer seeding, in August, resulted in low yields. An August seeding thinly covered with straw in November produced nearly twice as much hay the following season as an uncovered plat.

The value of sweet clover for pastures has been demonstrated. Annual or Hubam sweet clover appears to be inferior to the commonly grown biennial white sweet clover. The annual made a very rank growth when grown in cultivated rows, but it did not compete successfully with weeds or other plants when sown alone or with nurse crops. Canadian Albotrae sweet clover obtained by R. A. Moore has produced hay of excellent quality, and when grown for seed yielded as much as 10 or 12 bu. per acre.

In comparisons of emergency hay crops (E. S. R., 51, p. 35) by G. B. Mortimer the hay from soy beans and Sudan grass grown together was found to be more readily cured than soy beans alone because of the better circulation of air in the haycocks or windrows, and this combination produced more hay per acre than soy beans alone. Several other combinations with soy beans were unsatisfactory.

From extensive trials by W. H. Wright with soy bean inoculation, it appeared that different strains of bacteria used in inoculating soy beans differ in their nitrogen-fixing efficiency and in their ability to produce nodules on the roots of the plants. Varieties of beans differ in their relative "susceptibility" of inoculation. The efficiency of the nitrogen fixed varies with the soil composition and reaction. Variations between subgroups, derived from the natural groups of legume bacteria by J. W. Stevens using the agglutination reaction, seem to be more in the ability of the bacteria to assist the green plant than in actual nodule-forming power. In the experiments, the nodules were sometimes more abundant on the roots of the plant inoculated with strains producing the smallest growth than on those inoculated with strains producing the largest growth. The plants making the most growth contained the higher percentage of nitrogen. Inoculation had a good effect upon the yield of shelled canning peas and was profitable on the more fertile soils as well as on the lighter types.

Equally good results have been obtained by B. D. Leith when using the same amount of seed grain either broadcasted or drilled. Seeding winter wheat during the latter part of September resulted in higher average yields, and 1.5 bu. per acre seemed the best rate. Corn grown for silage by H. W. Albertz suffered very little from the competition of such crops as winter vetch, sweet clover, soy beans, alfalfa, rape, and field peas, which may be sown in corn at the last cultivation, usually early in July, since the secondary crops usually make their greatest growth after the corn is cut. Appreciable gains appear obtainable if heavy plantings of soy beans are incorporated with corn for silage.

Examination showed R. A. Brink that the food stored in the pollen of different varieties of corn corresponds rather closely in its nature with the materials laid down in the seed itself. Races of corn which produce starchy seeds bear pollen containing more or less starch, whereas it was shown that the pollen, as well as the endosperm of "waxy" maize, lacks starch, which is replaced by a closely related substance, probably a dextrin. The starchy character is said to be dominant to the nonstarchy condition.

Spring wheat and oats were found by A. H. Wright to be the most satisfactory grains with which to produce flax as a cash crop. Barley and the early varieties of oats were less desirable because they mature so much earlier than the flax. The most promising proportions of flax to oats for seeding were 28 lbs.: 48 lbs., 28: 40, and 35: 32. Experimental results indicated that flax will produce a satisfactory crop for the first year on fresh sod marshes if the land is properly drained and the sod covering complete. Drained peats with little or no sod ocvering and previously cultivated peat soils are usually unsatisfactory for seed flax.

Fertilizer treatments were usually not helpful in producing a desirable hemp fiber on the university marsh soil, whereas it appears that satisfactory hemp can be grown on the Horicon marsh near Waupun by the use of a limited amount of fertilizer containing both potash and phosphates.

Experiments with emmer, spelt, and einkorn, J. H. MARTIN and C. E. LEIGHTY (*U. S. Dept. Agr. Bul. 1197 (1924), pp. 60, pls. 3, figs. 3*).—A compilation of practically all of the results of important varietal and cultural experiments with emmer, spelt, and einkorn which have been carried on in the United States and Canada is presented, with information on their characteristics, history, distribution, bushel weights, composition, uses, and varieties. Most of the results were obtained by this Department either cooperatively with State experiment stations or other agencies.

Winter emmer is not considered hardy enough to be grown on the Great Plains north of Kansas, and even in Kansas it may be winterkilled. It is less productive than winter spelt, and because of its low yields it should not be grown in any part of the United States or Canada. Spring emmer should not be grown, except possibly to some extent in North Dakota, eastern South Dakota, and southern Minnesota, for the purpose of increasing crop diversification. In all sections of these States it is outyielded, on the average, by the leading varieties of barley or oats, or both, although in some years at some stations it will outyield these crops. Even under conditions where rust and drought commonly occur emmer does not compare favorably with barley and oats. Vernal (White Spring or Common) is held the best variety of emmer.

Winter spelt is more productive than barley and oats in a limited portion of Maryland and Virginia, where experiments have been carried on, and apparently also in central Utah. The limits of its adaptation have not been determined, but it is probable that it will be found to give best results in comparison with other small grain feed crops in the area between the spring and winter oats and barley areas. It does not produce as high net yields of threshed kernels as does winter wheat, even in those districts where it appears promising.

Einkorn is not grown commercially in this country.

Wheat and flax as combination crops, A. C. Arny (*Minnesota Sta. Bul. 206 (1924), pp. 4–12, figs. 2*).—Further tests of the growing of wheat and flax as combination crops (E. S. R., 49, p. 431) were made in several localities in Minnesota in 1923. The merits of the practice are outlined with cultural methods considered suitable.

Combination crops thrived, and some increases in yield were generally obtained as compared with either wheat or flax grown alone. The acre seeding of 45 lbs. of wheat and 42 lbs. of flax averaged the highest increase in yield, and was followed by the rate of 45 lbs. of wheat and 28 lbs. of flax. For planting flax alone 42 lbs. of seed is indicated. The acre value of the combination generally exceeded that of wheat alone but was less than that of flax alone.

Bean growing in Michigan, J. F. Cox and H. R. Pettigrove (*Michigan Sta. Spec. Bul. 129 (1924), pp. 3–21, figs. 16*).—Varieties, cultural and field methods, rotations, and harvest and marketing practices are suggested for the production of beans in Michigan. R. H. Pettit describes a method for controlling the bean weevil, and G. A. Brown indicates the value of cull beans and bean pods as feed for swine and sheep. The Michigan bean grades are appended.

The clovers and clover seed production in Michigan, J. F. Cox and C. R. Megee (*Michigan Sta. Spec. Bul. 130 (1924), pp. 23, figs. 13*).—Cultural methods and field practices are outlined for growing the clovers, particularly red, mammoth, and alsike clovers for hay, pasture, seed, and in rotations, attention also being given clover failure (E. S. R., 51, p. 138), sources and quality of seed, and clover pests.

Popcorn pointers, A. F. Yeager (*North Dakota Sta. Circ. 24 (1924), pp. 8, figs. 3*).—Cultural, harvesting, and marketing methods are outlined for the North Dakota pop-corn grower, with a brief report of experiments with the crop.

It is concluded that planting could well be confined to Japanese Hull-less and Black Beauty, outstanding in popping quality among varieties considered safe for the vicinity of Fargo. See also other notes (E. S. R., 50, p. 535; 51, p. 260).

Observations on the relation of moisture to popping quality indicate that the optimum moisture content would be between 11 and 13.5 per cent, and that a moisture content below 10 per cent makes corn unsatisfactory for popping. Reducing the moisture content within reasonable limits did not decrease the percentage of the kernals popping, but merely diminished the size of the individual popped kernels, suggesting that the percentage of kernels popping is not a reliable index of popping value. Too much moisture seems to have as bad an effect as too little. Storing overdried pop corn in normally moist air appears to be a way for properly restoring moisture.

Selective fertilization in cotton, T. H. KEARNEY and G. J. HARRISON (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 6, pp. 329–340*).—Experiments carried on at the Cooperative Testing Station at Sacaton, Ariz., involving Pima Egyptian cotton and Lone Star and Acala, upland varieties, gave evidence that selective fertilization occurs in both types and in about the same degree. Nearly 75 per cent of the ovules on the average are fertilized by pollen of the same type and variety when pollen of the other type is present on the stigmas simultaneously and in about equal quantity. It is held that this evidence of pronounced selective fertilization should be considered in connection with the data given earlier (E. S. R., 49, p. 226) that as a rule most of the pollen grains reaching the cotton stigmas are originated in the same flower, i. e., there is usually present on the stigmas an excess of self-pollen over foreign pollen. These findings are thought to explain satisfactorily the fact that self-fertilization predominates in cotton, although the flower is well adapted to cross-pollination. The only hypothesis seeming to fit the observed facts is that the presence of like pollen in some way prevents the germination or subsequent development of many of the unlike pollen grains when both kinds are present on the stigmas.

Flaxseed production, T. E. STOA and A. C. DILLMAN (*North Dakota Sta. Bul. 178* (*1924*), *pp. 43, figs. 11*).—The production areas, uses, and economic status of the flaxseed crop are reviewed, the problems involved in its production in North Dakota are enumerated, and a report is made of experiments carried on with seed at the station and substations, often in cooperation with the U. S. Department of Agriculture. The diseases of flax and insect pests and their control are described briefly.

N. D. R. No. 114 and N. D. R. No. 52 have been the highest yielding varieties of flax on wilt infested soil in eastern North Dakota. N. D. R. No. 114 is highly wilt resistant and is considered especially desirable for land where wilt is likely to influence yields. The wilt disease is not yet so generally present in the soils of western North Dakota, under which conditions the larger seeded types of flax, Frontier (N. D. No. 155), or its strains, and N. D. R. No. 52, usually outyield N. D. R. No. 114.

In 1918 and 1923 young flax plants withstood, without serious injury, minimum air temperatures of from 21° to 23° F.

A seeding rate of 2 pk. per acre has given the best results in eastern North Dakota, whereas about 20 lbs. per acre seems enough in western North Dakota. On the less fertile and weedy lands and where diseases are a factor, a heavier rate may be warranted. Seeding in late April or early May is recommended for land infested with pigeon grass (yellow and green foxtail) in eastern North Dakota. Flax seeded April 20 to May 10 at Fargo has given uniformly higher yields than when seeded later in May, or as late as June 10. Observations have shown that pigeon grass is far more vigorous in fields seeded in late May and early June than in those from earlier seedings. In general, yields in dry years are influenced more by the Russian thistle present than by the date of seeding. Where thistles are numerous the results indicate that the advantages of early seeding may be lost.

Considerable space is devoted to weeds and their control. In experiments at Mandan from 1919 to 1922, flax transpired about 800 lbs. of water to produce 1 lb. of dry matter, including seed, durum wheat 450 lbs., and Russian thistle about 220 lbs. This greater efficiency of the Russian thistle shows why it is such an injurious weed in dry areas. Tillage experiments during seven years at Fargo showed that where flax is seeded on corn ground in eastern North Dakota, early seeding will produce distinctly higher yields. The flax stands obtained will be more effective in the control of pigeon grass than the stands from delayed seeding and extra tillage. In preliminary tests at Mandan, disking appeared to control weeds better than plowing. At Mandan weeds in flax alone amounted to 1,493 lbs. (air dry) per acre, whereas four mixtures contained from 704 to 966 lbs. and wheat alone 253 lbs. per acre. Where only 10 lbs. of wheat per acre were seeded in mixtures, no material check on weed was effected.

The merits of mixed cropping of flax and wheat (E. S. R., 49, p. 431) are discussed, with instructions for handling the mixed crop. Comparisons of the flax-wheat mixture and single cropping were made in several localities in North Dakota in 1923. At Fargo, five mixtures varying in the proportions of flax and wheat seeded gave flax yields ranging from 3 to 11.5 bu. and wheat from 10.8 to 19 bu. per acre. The lighter proportions of wheat seeded were followed by higher flax yields and lower wheat yields. Flax seeded alone yielded 18.5 bu. and wheat 22 bu. per acre. Flax grown alone returned a higher gross income than the mixed crop or wheat alone. At Dickinson, five of six mixtures of flax and wheat produced satisfactory results, while at Mandan results were less favorable. The relative yields of flax-oats mixtures at Mandan in 1923 are compared with those of the crops grown alone. In a trial at Williston under irrigation the mixed crop returned a higher gross income per acre than flax or wheat grown separately.

Soybean culture, T. K. Wolfe (*Virginia Sta. Bul. 235 (1924), pp. 32, figs. 15*).—The soil, climatic, and cultural needs of soybeans are described, varieties are indicated for different purposes in the several sections of the State, the place of the crop in rotation is shown, and methods of harvesting the crop for hay, silage, and seed are outlined.

Results at the Nansemond County Substation indicate that for soy beans burned lime should be used at the rate of 1,000 lbs. per acre or ground limestone, marl, or ground oyster shells at the rate of 2,000 lbs. For liming soy beans in portions of the State other than Tidewater the use of 2,000 lbs. of burned lime per acre or 4,000 lbs. of ground limestone, marl, or ground oyster shells is recommended. The highest yields of both hay and seed in seeding trials were obtained from early seedings, and yields gradually decreased with the lateness of seeding. The late seeded crops matured in a shorter time than the early seeded ones. Yields in a rate and method of seeding test with Hollybrook and Wilson soy beans are tabulated. When a number of common fertilizers were placed in the row with seed just inoculated with soy-bean bacteria, none of the fertilizers reduced nodule development on the plants.

The best average hay yield in cultivation tests was produced in rows given three cultivations. Soy beans planted with corn did not reduce corn yields in favorable seasons at the Nansemond County Substation, and in no year did the mixture yield less than corn alone. Soy beans grown alone at the Charlotte County Substation yielded more hay than when grown with cowpeas. However, the mixture surpassed the yield of cowpeas grown alone. Where soy beans and wheat were grown in alternate years and acid phosphate and potassium chlorid were applied to the wheat, when the soy beans were cut for hay the yield of wheat was 3.5 bu. more per acre than on a plat without soy beans, and when the entire crop of soy beans was turned under the wheat yield was 10.1 bu. per acre greater.

The sugar yield of the Uba cane in Porto Rico, F. A. López Domínguez (*Porto Rico Dept. Agr. and Labor Sta. Bul. 28 (1924), pp. 55*).—An English edition of the publication already noted (E. S. R., 50, p. 640).

Curing conditions affect quality of tobacco (*Wisconsin Sta. Bul. 362 (1924), pp. 55, 56, fig. 1*).—Curing experiments with tobacco showed J. Johnson that proper curing can be obtained only between temperatures of about 70 and 100° F., abnormal processes occurring below and above these temperatures. The best cures were usually obtained between 85 and 95°, provided the humidity was kept high enough. Results seem to be related more to the evaporating power of the air than to the relative humidity. It was found that if the temperature is too low or the humidity too low, the leaf usually cures out with a greenish color, although this may be partly overcome by subsequent curing under good conditions. When the temperature is too high the leaf is killed quickly and develops an olive-green color. If, however, the humidity is too high, damage occurs due partly to development of decay fungi in the tissues. Shed burn seems to occur only under extremely moist conditions which do not permit evaporation of the moisture transpired from the surface of the leaf. Stem rot occurs at somewhat lower moisture conditions than shed burn, but neither prevails until the leaf tissues are about in the middle of the curing stage.

HORTICULTURE.

[Horticultural investigations at the Iowa Station] (*Iowa Sta. Rpt. 1923, pp. 36, 45, 46, 47, 48, 57–59*).—Hardiness studies with the apple, continued (E. S. R., 49, p. 740) along the lines reported last year, indicate that the ground wood pulp of a hardy variety absorbs moisture from a saturated atmosphere at a more rapid rate than similar material from a less hardy variety. In an attempt to discover a cheap and effective spreader for use in orchard spraying, it was found that the addition of 1 gal. of sour milk and 2 oz. of bicarbonate of soda to 200 gal. of lime sulphur mixture gave as satisfactory results as did commercially prepared caseinate. Studies with orchard fruit stocks showed that certain stocks have such a free rooting tendency that even large limbs can be made to root quite freely.

Fertilizer experiments on apple trees growing on a heavy black soil at Williamsburg showed no marked response to any of the treatments, the check trees producing nearly as well as those fertilized. Similar results were obtained on a similar soil type at Charles City, where the application of fertilizers had no effect on yield or upon the bearing habit of the trees in respect to on-and-off year fruiting. A single application in the spring of 1922 of nitrate of soda and ammonia sulphate to poorly nourished trees growing on a blue grass sod at Council Bluffs greatly increased the yield above that of control trees. The size of the apples and the amount of twig growth on the fertilized trees were also markedly increased.

Studies of the fruit of apple seedlings developed in breeding operations indicated the advisability of withholding final judgment, the fruit of a single tree apparently varying greatly according to the character of the season. The bearing habit of seedlings generally resembled that of the parents, but were often observed to be transmitted in a blended condition. Observations are presented upon five recently named apple seedlings, Ames, Sharon, Hawkeye Greening, Macy, and Secor. Seedlings of Antonovka, Delicious, King David, and Northwestern Greening have shown exceptional vigor in the nursery.

Studies of the performance of apple trees grown in soil, samples of which had been previously analyzed, showed a close relation between the growth of the trees and the nitrate content of the soil. The application of 5 lbs. of nitrate of soda to trees which had been continuously in blue grass sod greatly stimulated the size and the amount of the resulting fruit. Moreover, in contrast to unfertilized trees, the fertilized produced a satisfactory growth of fruit buds for the succeeding year.

[Horticultural investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1923, pp. 28–38*).—As for the preceding annual period (E. S. R., 49, p. 532), brief statements are presented upon the progress of various investigational activities.

With the exception of the Jonathan, all apple varieties that produced a heavy crop in 1922 set a light crop in the spring of 1923, their off year. Observations on the fruiting performance of apple grafts one and two years old at the time of insertion showed no significant differences in bearing capacity in relation to initial age.

Continuing previous work (E. S. R., 48, p. 837), detailed records are presented upon orchard heating activities conducted during a period of low temperature extending from March 12 to 23, 1923, at which time Japanese plums and some varieties of peaches were in full or partial bloom. Temperatures in the orchards were raised a maximum of 9.75° F., but not sufficient to save the open flowers, because of the very low temperature minimum (14.5°) reached. The promise of a heavy crop of pears on Bartlett trees was ruined by a severe attack of bacterial blight, which reached alarming proportions despite an effort to remove affected twigs.

An outstanding feature of the 1923 results in the cabbage fertilization experiment was the uniform increase in production in all plats irrespective of fertilizer treatment, due to the control of diseases and insect pests. Although no manure was applied to the manure plat since 1921, this area continued in the lead in respect to yield. Brief notes are presented on the behavior of strawberry varieties.

English walnuts continued to do poorly on account of the winter injury. Of pecans tested, Texas Prolific, Success, Van Deman, Money Maker, Halbert, Indiana, Kentucky, and Warrick set heavy crops in 1923. Of these, the Texas Prolific, Indiana, and Halbert are deemed most promising. The Success is an excellent variety, possessing desirable cracking qualities, but is a little too late in maturing.

[Horticultural investigations at the South Dakota Station], N. E. HANSEN (*South Dakota Sta. Rpt. 1923, pp. 26–33*).—A progress report (E. S. R., 49, p. 533), consisting for the most part of descriptive notes upon fruit and flower seedlings and introductions. The Anoka apple, a seedling of Mercer wild crab, is deemed of particular promise since it bears on one-year wood, and the fruits attain a diameter of 2.5 in., the flesh being white and of good subacid flavor.

[Horticultural investigations at the Ohio Station] (*Ohio Sta. Bul. 373 (1923), pp. 42–47, 48, 49*).—Records taken since planting upon 9-year-old, unfertilized Stayman and Delicious apple trees growing on level, arable land at Wooster showed a markedly lower cost of growing for the mulched trees than for those in tillage with cover crops. In addition, mulched trees came into bearing earlier and, although somewhat smaller, have up to the present time produced much more fruit. Controlled crosses in which Stayman was used as ovule parent and various important commercial varieties as pollen parents indicated that Baldwin, Wealthy, and Stayman are poor pollinizers for Stayman. The best results were attained with York, Yellow Transparent, and Rome. The intersterility of Stayman and Baldwin was further shown by the poor sets of fruit obtained when the two varieties were enclosed under a single cheesecloth tent containing a hive of bees. In discussing grape varieties, brief notes are presented upon several old and new kinds not commonly grown but deemed of considerable merit.

The relation of lime to vegetable growing is again reviewed (E. S. R., 51, p. 143). A strain of Grand Rapids lettuce isolated in 1908 has proved valuable on account of uniformity and ability to thrive in cloudy weather and under low temperatures. Observations indicated that the shading of fruit and vegetable plants usually results in increased leaf surface, elongation and thinning of the internodes, and decrease in flowering. The shaded plant tissue was found to contain more nitrogen and less carbohydrates than normal tissue. Swiss chard was especially unable to withstand shading.

That soil character has much to do with the response of fruit trees to fertilizers was indicated in results at the Clermont and Hamilton County farms. At the Clermont farm, sulphate of ammonia was more effective than nitrate of soda on both grass mulch and tillage plus cover crop areas, while at the Hamilton farm the reverse was true. At the Clermont farm fertilizers increased yields on both mulched and tilled plats and at Hamilton on the mulched area only.

Spraying studies indicated that lime sulphur is superior to Bordeaux mixture as a summer spray, in that the fruit from the lime sulphur trees was of better color and of finer appearance and entirely free from San José scale, a blemish especially abundant on the Bordeaux sprayed fruits.

Tomato growing in Michigan, E. P. Lewis (*Michigan Sta. Spec. Bul. 131* (*1924*), *pp. 3–14, figs. 10*).—This bulletin, presenting general information on the culture and care of the tomato, is a revision of one noted earlier (E. S. R., 39, p. 445.)

Watermelons, W. R. Beattie (*U. S. Dept. Agr., Farmers' Bul. 1394* (*1924*), *pp. II+22, figs. 12*).—General information is presented upon the extent and distribution of the watermelon-growing industry in the United States, upon soils, rotations, preparation of the soil, use of ferilizers, varieties, importance of good seed, planting practices, culture, combating of insect and fungus enemies, and general economic considerations. The section on diseases was revised by F. C. Meier and that on insects by F. H. Chittenden.

Vegetable seeds for the home and market garden, W. W. Tracy, sr., and D. N. Shoemaker (*U. S. Dept. Agr., Farmers' Bul. 1390* (*1924*), *pp. II+14, figs. 5*).—This revised edition of an earlier noted publication (E. S. R., 38, p. 241) presents information on the growing, harvesting, and preservation of vegetable seeds, laying particular stress on those species which may be satisfactorily and advantageously handled by the home and market gardener.

Vegetables and fruits from all parts of the world, I, II, R. de Noter (*Légumes et Fruits des Cinq Parties du Monde, I, II. Paris: Gauthier-Villars & Co., 1923, pts. 1, pp. VI+225, figs. 43; 2, pp.* [*4*]*+137, figs. 41*).—Preceded by brief cultural considerations, encyclopedic notes are presented upon species of vegetables (part 1) and of fruits (part 2) from various parts of the world.

Economic fruit-bearing plants of Ecuador, W. Popenoe (*U. S. Natl. Mus., Contrib. U. S. Natl. Herbarium, 24* (*1924*), *pt. 5, pp. 101–134+IX, pls. 16*).—A profusely illustrated paper presenting systematically arranged information on indigenous and exotic fruits of Ecuador, a country capable of growing a multiplicity of species, ranging from tropical to Temperate Zone types.

Nitrogen fertilization affects off-year production (*Wisconsin Sta. Bul. 362* (*1924*), *p. 52*).—Studies conducted by R. H. Roberts indicate that the so-called first drop which occurs in many fruits shortly after the blossom stage is not due to lack of pollination, but to imperfect nutritional conditions in the tree which prevent normal development of the ovules. The second and third drops are also believed to be due to nutritional defects. It is suggested that trees in good vegetative condition will lose a minimum number of fruits by dropping.

Effects of oil sprays on fruit trees, A. M. Burroughs (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 269–277*).—This is a preliminary report upon investigations begun at the Missouri Experiment Station in the spring of 1923 to determine the effects of engine oil emulsion sprays on fruit trees.

Qualitative tests for starch in apple leaves sprayed with 2 per cent oil showed that the live portion of leaves which were partly burned by the spray generally contained no starch. This was also generally true of leaves which appeared to have stopped growing because of the oil injury. On the other hand, many sprayed leaves responded as well to the iodin test as did the unsprayed. As indicated by the burette potometer, the transpiration rate of oil-injured leaves was markedly below that of unsprayed and also uninjured sprayed leaves. On the other hand, the difference in the rate of transpiration of the unsprayed and the uninjured sprayed leaves was so small as to be well within the limit of experimental error. Outward manifestations of oil injury were the retardation of the leaf growth, yellowing of the leaves, the dropping of leaves and fruit, and in a few cases the death of fruit buds or entire branches.

One year's study of the effect of oil sprays of various concentrations on dormant trees revealed no instance of visible injury resulting from applications up to 12 per cent on any kind of tree and no injury to apples from concentrations up to 50 per cent of oil. No retardation in the time of opening of fruit buds was noted, although hastening was observed in one instance, that of Montmorency cherry.

Observations in a considerable number of Missouri orchards, including that of the station, sprayed with 2 per cent engine oil in the summer of 1923 showed more or less foliage burning. Severe abscission of the leaves and fruit followed repeated applications of oil sprays, and severe burning always occurred when oil was used as a spray for stone fruits. As a general conclusion, the author advises that summer spraying with oil upon deciduous fruit trees should not become a commercial practice until safety is proved by experimental investigations.

Spraying experiments for the control of diseases and insects of the apple, R. A. Jehle and E. N. Cory (*Maryland Sta. Bul. 262 (1924), pp. 157–167*).—As a result of spraying investigations at Preston and Whiteford in 1921 and 1922, in which the regular spraying schedule was modified in one instance by the inclusion of a supplemental spray of Bordeaux mixture after harvest and in the other by the additional late fall spray and the substitution of Bordeaux mixture for lime sulphur in the pink bud spray, the authors conclude that lime sulphur applied thoroughly and at the right time is satisfactory and effective. The additional Bordeaux spray gave a slight gain in the number of scab-free apples, the gain being, however, so insignificant as to render the additional treatment unprofitable. Records showed that, at the pink bud stage, lime sulphur was not only equally as effective as Bordeaux mixture for the control of scab, but also that the percentage of spray-burned apples was less. Adherence to the regular schedule resulted in satisfactory control of codling moth and curculio.

Investigations in the rooting of apple cuttings, A. F. Vierheller (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 250–255, fig. 1*).—A report of work conducted at the University of Maryland in which various treatments, including modifications in temperature, moisture, light, air conditions, and acidity of the soil, cutting treatments, etc., were unsuccessfully applied to apple shoots taken from girdled and normal branches of vigorous trees in an attempt to induce root formation.

The Chinese bush cherry, G. M. DARROW (*Jour. Heredity, 15 (1924), No. 4, pp. 169–176, figs. 6*).—A brief account of an introduced fruit species, *Prunus tomentosa*, which is said to have proved its adaptability to the arid and cold regions of the United States.

A survey of orchard practices in the citrus industry of southern California, R. S. VAILE (*California Sta. Bul. 374 (1924), pp. 3–40, figs. 4*).—A careful analysis of owners' records kept during a five-year period in approximately 1,000 southern California citrus orchards indicates the relative influence of various factors, namely, climate, soil, age of trees, fertilizers, culture, and irrigation, upon the profitableness of citrus orchards.

In general, citrus groves near the coast produced more fruit per acre than those in the interior valleys. In respect to soil, it was found that those orchards located on fine sandy loams gave the highest average yields. An apparently definite relationship was found between the age of trees and their producing capacities, yields steadily increasing with advancing age to approximately 35 years. Nitrogen and bulky organic manures appeared to be the only fertilizing materials of value for citrus trees. The average yield increased with nitrogen applications up to about 350 lbs. per acre, but, as indicated in a previously noted paper (E. S. R., 48, p. 446), mottling of the leaves apparently followed excessive applications of nitrogen. Orchards winter-cover cropped gave higher yields than clean cultivated orchards receiving the same quantity of bulky organic fertilizers. Although approximately one-half of the groves considered in the study were plowed each spring, no significant difference was found in the average yields of the plowed and the unplowed orchards. A study of irrigation records showed that not only was less water used in the orchards near the coast, but that the intervals between profitable water applications were much longer than for interior orchards.

Cost studies indicated that the citrus industry has reached a stage of stability, as a close agreement was noted between (1) the grower's estimate of the exchange value of groves, (2) the capitalization of the present earning power of groves, and (3) the cost of developing new groves on land purchased at its present evaluation for other crops. The larger yields of coastal orchards were offset by higher land values, rendering net profits per acre for the two sections practically equal. Tabulations and a discussion of methods of technique employed in the analysis of the data are appended.

The Chinese jujube, C. C. THOMAS and C. G. CHURCH (*U. S. Dept. Agr. Bul. 1215 (1924), pp. 31, pls. 8, figs. 8*).—The major part of this paper, by Thomas, discusses the botany, introduction into the United States, varieties, propagation, culture, pruning, methods of utilization, etc. A chapter entitled The Composition of the Chinese Jujube, by Church, presents the results of analyses of 14 samples of jujubes, representing 6 varieties harvested at different stages of maturity. The fruit was found to resemble closely the fig and date in point of edible material, total sugars, and ash.

FORESTRY.

Use of statistical methods in forest research, J. KITTREDGE, JR. (*Jour. Forestry, 22 (1924), No. 3, pp. 306–314*).—Emphasizing the value of statistical methods in research work in general, the author discusses their application to forestry problems and points out how the use of such would aid in the more accurate interpretation of field results.

[Forestry investigations at the Ohio Station] (*Ohio Sta. Bul. 373 (1923), pp. 50–53*).—A general report on forestry activities, including accessions, fire control, State forest administration, etc. Approximately 1,750,000 trees, mostly coniferous, are contained in the forest nurseries at Chillicothe, Dean Forest, and Wooster. Growth studies upon white ash and tulip poplar indicated that white ash under very favorable growing conditions may be expected to yield 20,000 board feet per acre in 50 years. Tulip poplar may be expected to yield 50 cords per acre in 40 years.

Moisture content and regional spread of moisture in the living teak (Tectona grandis L. f.) [trans. title], C. Coster (*Tectona (Boschbouwk. Tijdschr.), 16 (1923), No. 11–12, pp. 935–1045, figs. 21*).—Investigations conductel at Toeban, a place in eastern Java where the climate shows a sharply pronounced dry period each year, showed the moisture content of the sapwood of 20-year-old teak trees to diminish during the dry season, while that of the heartwood remained practically constant throughout the year. The periodic changes in moisture content were more marked in the outer layers. This was especially true in the bark, which was found to contain about 70 per cent less water, on the basis of oven-dry weights, during the dry season.

Yield and growth in Hevea brasiliensis, G. Bryce and C. H. Gadd (*Ceylon Dept. Agr. Bul. 68 (1924), pp. 74, figs. 10*).—Statistical analyses of the individual yields of 155 Hevea seedlings resulting from the open pollination of a highly productive tree indicate that the tendency to give high yields is maintained from year to year. The coefficent of correlation between yields of individual trees in 1921–22 and 1922–23 was 0.83±0.017. The highest yielding trees also made the greatest proportional increase in yield. Trees making the greatest growth in 1921 maintained this advantage in 1923, *r* being 0.96±0.006. However, the trees possessing the smallest girth in 1921 made, on the average, the greatest increase in girth in proportion to their initial size.

A positive correlation 0.54±0.039 between the number of latex vessel areas in 1921 and in 1923 indicates that, on the average, the trees having the largest number in 1921 also had the largest number in 1923. This maintenance of differences was more positive in the thickness of the cortex at 2 ft., the coefficient of correlation in this instance being 0.86±0.014.

Girth, cortex thickness, and the number of latex vessels were found to be so interlinked that a change in one was accompanied by a corresponding change in the others. Increase in growth of tree was not necessarily accompanied by an increased yield of latex. Yield is believed to be an inherent character, not modified by cultivation or fertilization except as these practices tend to keep the tree in a healthy, vigorous condition.

The effect of the removal of the bark on the rate of shrinkage in logs [trans. title], A. te Wechel (*Meded. Landbouwhoogesch. [Wageningen], 27 (1923), No. 1, pp. 11, pls. 2, figs. 2*).—Data taken on freshly cut logs, some of which were barked, showed that the barked logs dry very much more rapidly than untreated ones. The coating of the ends with preservative material had only a slight influence upon the rate of drying, confirming the author's belief that drying takes place largely through the medullary rays.

A dictionary of names applied to trees of the first, second, and third groups (*[Philippine] Bur. Forestry Bul. 23 (1923), pp. 40*).—A list of common names and synonyms.

DISEASES OF PLANTS.

[Report of the department of biology] (*New Mexico Sta. Rpt. 1923, pp. 17, 18*).—In a summary account of the investigation carried on, it is claimed that there is no evidence of a definite correlation between the percentage of moisture in the soil and the percentage of wilted pepper plants. The variations which have been observed are considered due to the fact that the soil in some parts of the field was much more heavily infected with Fusarium than in other parts.

Laboratory experiments were continued on apple measles, with negative results. Field work, including inoculations, failed to show the characteristic behavior of disease, and considerable difficulty was encountered when trying to use as stocks wood infested with measles, as it seemed to have little vitality.

In connection with a study of chlorosis, soil analysis is said to indicate that chlorosis is not a specific entity as there is always a deficiency in some one of the constituents of the soil wherever chlorosis occurs. The use of ferrous sulphate, either as a spray or by boring into the trunks of the trees, is said to be only temporarily expedient, and it may disfigure or kill the tree. It is claimed that sand and dust storms apparently affect the ability of the chlorophyll of the trees to function, as it has been noticed that following a heavy washing rain the trees recover somewhat. A number of chlorotic annual plants were washed every two weeks by spraying, with apparent improvement in their symptoms.

[Plant disease investigations of the Ohio Station] (*Ohio Sta. Bul. 373* (*1923*), *pp. 35–37*).—In experiments for the prevention of stinking smut or bunt of wheat, copper carbonate dust applied at the rate of 3 oz. per bushel is said to have given excellent control on a variety of winter wheat that is very susceptible to the disease. Similar results were obtained with a variety of spring wheat.

A study was made of the resistance of varieties of sweet corn to Stewart's bacterial disease. Several varieties were found quite resistant and others varied in their susceptibility.

Experiments for the control of brown rot and scab of peaches were carried on in which it was found that lime sulphur 8–4–50 was stronger than necessary. Equally good results were obtained from a spray of half this strength. A satisfactory mixture was obtained by adding dissolved glue to the spray mixture.

In a study carried on for three years, to determine means for the control of potato scab, a considerable number of fungicides were tested, all of which gave a certain degree of control when the scab organism did not exist in the soil. The experiment has indicated that rotation is necessary to free the soil of the organism. The application of from 500 to 800 lbs. of sulphur per acre showed almost complete control of scab whether the seed was treated or not.

Report of the pathologist for the period June 10 to December 31, 1921, H. H. Whetzel (*Bermuda Bd. and Dept. Agr. Rpts. 1921, pp. 30–64*).—A general and detailed report of the situation as found to exist during the latter part of 1921 states that the plants of Bermuda appear to be affected, in the main, with the common diseases to which these plants are subjected in other countries where they occur. By far the most of these diseases are caused by fungi, though such diseases as crown gall and black rot of cabbage, kale, and turnips have been observed. In addition to mosaic on a few weeds and crops (particularly potatoes), broad beans, snap beans, and tomatoes suffer more or less. Insect pests are also dealt with, and reports are made on diseases of other of the more important economic plants.

Absolute control of environmental conditions (*Wisconsin Sta. Bul. 362* (*1924*), *pp. 50, 51, 53, fig. 1*).—A description is given of the soil temperature tanks that have been developed at the Wisconsin Station and used extensively in studying the effect of environmental conditions on plant diseases.

Relation of environment to health and disease in plants (*Wisconsin Sta. Bul. 362 (1924), pp. 47–49, fig. 1*).—Early investigations of L. R. Jones on cabbage yellows indicated that the severity of this disease depends directly upon the weather and is worse in hot, dry summers.

Greenhouse studies with seedling cabbages were carried on by J. C. Gilman and W. B. Tisdale, who found that the higher the temperature within the usual field range, the worse the disease. On the other hand, even in the sickest soil a low temperature so inhibits the disease that healthy plants may be grown if the soil is kept continuously cool. The critical soil temperature was found to be about 62° F. Similar relations were demonstrated for the related wilt of flax. The critical temperature of this disease, however, was found to be about 56°.

J. Johnson and R. E. Hartman found that a low soil temperature favored root rot of tobacco. Similar environmental conditions are reported by B. L. Richards to stimulate potato canker, and Jones and H. H. McKinney found that high temperatures facilitate the development of potato scab.

Studies on nature of disease resistance in cereals (*Wisconsin Sta. Bul. 362 (1924), pp. 43–46, fig. 1*).—In continuation of investigations previously reported on seedling blight of wheat and other cereals due to *Gibberella saubinetii* (E. S. R., 49, p. 644), J. G. Dickson has shown that temperature relations of the host plant are important factors in the development of the blight. In addition to temperature, soil moisture was found to be an important factor. Lowering the moisture to a degree that inhibited the normal growth of the wheat and corn plants was found to predispose the plants to attacks of the fungus. Conditions of temperature or moisture that are unfavorable for the best development of the cereal seedling are said to predispose it to attacks by the fungus.

Where wheat seedlings were grown at low soil temperatures the fungus threads penetrated between the cell walls of the tissues, whereas at high soil temperatures direct and rapid cell penetration was found to occur. In corn seedlings grown at low soil temperatures direct penetration of the cell walls occurred, while at high soil temperatures there was a slow invasion between the cell walls by the organism.

Environmental factors over a period of considerable time were found more influential in determining predisposition to disease than brief exposures to extreme temperatures.

In a study of the chemical relations of the host to disease development it was found that the relatively high content of available carbohydrates in the wheat seedling at low soil temperatures and the corn seedling at high temperatures resulted in thickened cellulose walls, which offered resistance to fungus penetration.

Studies in the physiology and control of bunt, or stinking smut, of wheat, H. M. Woolman and H. B. Humphrey (*U. S. Dept. Agr. Bul. 1239 (1924), pp. 30, pls. 5, figs. 3*).—The results are given of studies on bunt, or stinking smut, of wheat carried on from 1913 to 1921, the field experiments being conducted for the most part at the Washington Experiment Station.

Wind dissemination of spores has been found to be the most important factor in the continued propagation of bunt in the Pacific Northwest. The spores have been found to lose their viability in from 30 to 60 days in moist soil, while in unbroken smut balls they retain their viability throughout the winter months, even when subjected to alternate freezing and thawing, and they have produced infection after lying 1.5 years in the soil. When continually subject to dry air in the laboratory or herbarium, bunt spores were found to retain their germinating power for 12 years, and possibly longer.

The minimum, optimum, and maximum temperatures for germination for spores of *Tilletia tritici* were found to be 0 to 1, 18 to 20, and 25 to 29.1° C., respectively. Wheat sown in soil at a temperature above 20° proved practically immune from bunt infection from seed-borne spores, but not necessarily from spores already in the soil. Spores exposed 5 days to a temperature of 29.1° failed to germinate when changed to the optimum temperature.

The presence of free oxygen was found necessary to the germination and normal growth of the bunt organism. The optimum soil-moisture content for infection in the basaltic soil of southeast Washington and adjacent Idaho and Oregon was between 16 and 30 per cent. The fungus was found capable of entering the wheat seedling at any point along the coleoptile, and under experimental conditions infection was produced after the seedling had developed its first leaf. There is said to be a direct correlation between the depth of sowing and the percentage of infection.

The resistance of a large number of varieties of wheat to bunt has been demonstrated, and it is claimed that varietal susceptibility is not determined by vigor and rapidity of growth or early ripening.

It is reported that a large part of the seed wheat sown in the semiarid regions of the western United States is killed by seed treatment because of injury to the seed coat during threshing. Infection from spores present in the soil is subject to partial control when the seed is treated with copper sulphate or commercial lime sulphur applied at full strength and allowed to dry. Such protection was not afforded by formaldehyde. Burying the spores below the seed bed by replowing the summer fallow will aid in controlling bunt.

The authors claim that bunt can be entirely prevented by sowing treated seed before the smut shower, characteristic of the region, and can be largely controlled by delaying the sowing until the saprophytic existence of the organism has terminated.

Experiments with flag smut of wheat and the causal fungus, Urocystis tritici Kcke., M. A. GRIFFITHS (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 7, pp. 425–450, pls. 3, fig. 1*).—The results are given of a study of flag smut of wheat (*U. tritici*), which is widely distributed throughout the world and is known to occur in the United States in several counties in Illinois, Missouri, and Kansas.

The fungus produces sori on the leaves, stalks, and glumes of the wheat, and badly infected plants do not head. Spores kept under laboratory conditions were viable for at least four years, and they have been found to live throughout the winter in the soil in the vicinity of St. Louis, Mo. Sowing inoculated wheat at successive dates in the fall at St. Louis, Mo., resulted in a general decrease in the percentages of infection. No disease occurred in sowings of November 14 or later. The temperature relations of the fungus were determined, and the highest percentages of infection were found to occur at 21.5 to 23.5° C. (70.7 to 74.3° F.). The most favorable stage of growth for infection was in the seedling stage before the coleoptile was broken and before the seedlings had emerged from the soil. A number of varieties of wheat have remained smut free during the three years of the experiment, and additional varieties were not attacked during the two years they were investigated.

Studies on the parasitism of Urocystis tritici Koern., the organism causing flag smut of wheat, R. J. NOBLE (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 7, pp. 451–490, pls. 3, figs. 2*).—A study was made of the reaction of the fungus to its environment and its relationship within the host.

Flag smut is said to be one of the most destructive diseases of wheat in Australia. The lesions produced by the fungus may first appear on plants at any stage of growth up to heading. Extensive studies were reported on the maturing of the spores, their germination as affected by various media, and the H-ion range for germination. The relative humidity to which spores are exposed was found to have a marked effect on their viability. Wheat seedlings in which the coleoptile was more than 4 mm. long did not become infected when inoculated with dry spores. Seedlings inoculated with a large number of dry spores sometimes showed no infection, while inoculations with a few germinating spores at suitable temperatures resulted in heavy infection. Soil temperatures ranging from 14 to 21° C (57.2 to 69.8° F.) were found to be the optimum for infection of wheat seedlings. The mycelium within the plant is said to be typically intercellular, and branching and fusion of the mycelium may occur within the plant. Infection hyphae of *U. tritici* are said to have been observed to enter the tissues of rye seedlings, which are known to be immune from the disease.

Morphological and physiological studies on the resistance of wheat to Puccinia graminis tritici Erikss. and Henn., C. R. Hursh (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 6, pp. 381–412, pls. 2, fig 1*).—A study is reported on the morphological differences in different varieties of wheat as affecting the entrance of germ tubes, the structural and physiological peculiarities which account for the inability of certain biological forms to develop in certain varieties of wheat, and on the change of the reaction of the host to the rust parasite due to structural and physiological characters altered by environmental factors.

In addition to fundamental protoplasmic resistance, wheat varieties are said to possess other means of defense against stem rust. The number of leaf hairs and the size and number of stomata are not considered important in influencing the entrance of germ tubes, but the stomatal movements may have some effect in preventing the penetration of the fungus. The mycelium within the host is said to be limited almost entirely to the chlorenchymatous tissue, and as the only important tissue of this kind in the stem is the collenchyma the rust mycelium can grow only in this region. In some varieties of wheat there is said to be such a large amount of sclerenchyma that the collenchymatous tissue is broken into small bundles, and the extent of mycelial development is limited to relatively small areas. The amount of sclerenchyma is not the same in stems of different varieties. Those varieties which have a great deal of sclerenchyma are likely to be injured less by rust through the mechanical limitation to the spread of the mycelium.

The relative proportion of sclerenchyma to collenchyma in a variety may be altered by the use of fertilizers. It is claimed that excessive fertilization with nitrogen has a tendency to decrease the amount of sclerenchyma.

The difference between susceptibilities of seedlings and older plants to biologic forms of *P. graminis* is explained by differences in morphology. There are also said to be differences in the physicochemical properties of the sap of different wheat varieties, although it has been impossible to make a definite correlation between these properties and rust resistance. The author considers that the differences in the reaction of wheat varieties to different biologic forms of *P. graminis tritici* are due to physiologic causes.

The effect of fertilizers on the development of stem rust of wheat, E. C. Stakman and Q. S. Aamodt (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 6, pp. 341–380, pls. 3, figs. 4*).—The results of experiments covering a period of eight years on the effect of fertilizers on the stem rust of wheat are given, in which it is shown that the degree of physiologic susceptibility of susceptible and resistant varieties was not changed directly by the use of different fertilizers, although morphologic resistance may be changed slightly. Plants growing in plats heavily fertilized with nitrogenous manures were sometimes more heavily attacked by stem rust than those in other plats, but this is thought to be an indirect effect due to increased density of stand and delayed maturity. In hot, dry weather plants heavily fertilized with nitrogen were found to burn out, thus indirectly causing a decrease in the amount of rust.

Some evidence was found to indicate that the amount of orange leaf rust may be increased by the use of nitrogenous fertilizers. The direct effect of fertilizers on the character of plant growth and yield appears to be much more important than their effect on the severity of stem rust. The date of maturity, degree of lodging, crinkling, shriveling of seed, percentage of yellow berry, and yield of straw and grain may be affected profoundly by different fertilizers.

The authors state that while the direct effect of fertilizers on the development of stem rust appears to be slight there is sometimes an intense indirect effect. It is considered advisable, therefore, to avoid excessive fertilization with nitrogen and to use phosphates and potassium fertilizers on those soils which need them.

Further studies on the intracellular bodies associated with certain mosaic diseases, L. O. KUNKEL (*Hawaii. Sugar Planters' Sta., Bot. Ser., Bul., 3 (1924), No. 2, pp. 108–114, pl. 1, figs. 2*).—In a previous publication (E. S. R., 46, p. 344) the author reported the presence of intracellular bodies associated with the mosaic disease of corn, and later he gave an account of the occurrence of similar bodies in *Hippeastrum equestre* (E. S. R., 46, p. 743).

Subsequent studies showed that these bodies were always present in the light green portions of diseased leaves and that similar bodies were found in mosaic tissues of Chinese cabbage, sugar cane, and tobacco.

While definite conclusions can not be drawn regarding them, the author claims for the present that intracellular amoeboid bodies accompany mosaic disease in different plants, that these bodies look like living organisms, and that in corn and Hippeastrum they are associated with chlorosis in such a way as to account for the mosaic pattern in the leaves.

Mosaic disease of cucumber and other plants (*Iowa Sta. Rpt. 1923, pp. 39, 40*).—A brief account is given of investigations of mosaic disease to determine the intertransmissibility between hosts and control measures. As a result of the investigations the following plants were found affected with mosaic that had not previously been reported in Iowa: Zinnia, calendula, celery, red raspberries, *Aquilegia coerulea*, *Stokesia* sp., *Euphorbia preslei*, *Vernonia fasciculata*, *Verbena urticaefolia*, *Lactuca scariola*, and *Abutilon theophrasti*.

Experiments in controlling insects known to be carriers of the mosaic disease were conducted under field conditions. From the standpoint of yield the cucumber aphis was controlled, but considering the transmission of mosaic the beetles were not efficiently controlled with any available insecticides.

A study of the celery early blight fungus, Cercospora apii Fres., L. J. KLOTZ (*Michigan Sta. Tech. Bul. 63 (1923), pp. 34, pls. 9*).—The author gives an account of an investigation of the early blight of celery due to *C. apii*.

A technical study was made of the causal organism and its physiological relation to the host plant, to temperature, reaction of medium, etc., as well as to methods for control. High temperatures supplemented by heavy evening dews, a dry soil, and consequently low vitality of the plants are said to be factors in the development of the disease. The fungus was found to enter the host through open stomata by means of conidial germ tubes. It was capable of germination in a pH range of from 4.6 to 8. The temperature relations showed that the parasite made its largest vegetative growth between 25 and 30° C., and that an exposure for 10 minutes to a temperature of 48° was fatal to the conidia. Spores germinated best at from 27 to 29°, but there was no germination after 12 hours' exposure to a temperature of 42°. Fourteen months' desiccation did not kill the mycelium, and spores were found capable of germination after 6 months' drying at room temperature.

A study of 12 different varieties of celery showed no appreciable difference in resistance to early blight. For the control of the disease the author recommends keeping the plants growing vigorously, supplemented by spraying with Bordeaux mixture as required.

Histological and cytological studies on the Fiji disease of sugar cane, L. O. Kunkel (*Hawaii. Sugar Planters' Sta., Bot. Ser., Bul., 3 (1924), No. 2, pp. 99–107, pls. 5, fig. 1*).—The results are given of a study of material collected in Fiji showing the so-called Fiji disease of sugar cane. This disease is said to be characterized by the presence of elongated swellings on the under surface of the leaves and stalks.

Previous investigators have reported intracellular bodies in the gall tissues, and the author undertook his investigation in the hope of finding the nature of the bodies and their relation to the disease.

His study did not yield sufficient evidence to justify a decision as to the nature of the peculiar intracellular bodies associated with the disease, but from the fact that the bodies are capable of division and appear to grow they are considered to be a parasitic organism. The studies have not shown any relationship between this and any other known plant disease. The galls always originate in the phloem, and although other tissues are affected to a certain extent it is considered as a phloem disease. Certain analogies between the Fiji disease and the mosaic disease of sugar cane are pointed out.

Studies on the mosaic of sugar cane, L. O. Kunkel (*Hawaii. Sugar Planters' Sta., Bot. Ser., Bul., 3 (1924), No. 2, pp. 115–167, pl. 1, figs. 19*).—The results are given of studies of sugar-cane mosaic, means by which it is spread, host plants, damage done by the disease, varietal resistance, and means of control.

In addition to transmission by the corn aphis, artificial transmission by juice from diseased plants was demonstrated. A considerable number of wild and cultivated species of grasses were found subject to the disease. Mosaic of sugar cane is said to apparently lower the resistance of cane to red rot due to *Colletotrichum falcatum*. There was found evidence that mosaic canes could under certain conditions recover from the disease. The deleterious effect of mosaic is shown in the lowered tonnage of cane and in the poorer juices. Commercial varieties of cane in Hawaii respond differently to the disease and in their resistance to it.

As control measures the author suggests wherever possible the growing of varieties that resist disease. Healthy seed cane should be planted and the fields kept as free as possible from wild grasses on which the corn aphid breeds. Badly diseased fields should be plowed up and replanted with healthy seed of resistant varieties. Where only a small amount of mosaic is present, roguing is advised.

Tobacco wildfire (*Wisconsin Sta. Bul. 362 (1924), pp. 56, 57, figs. 2*).—From a study of tobacco wildfire, J. Johnson reports that the bacteria live over winter mostly on or in cured or dried tobacco leaves or refuse, but that about 100 other plants may also be infected with the disease. It is thought possible that it may live over winter in the refuse of other plants and be a source of infection. It is recommended that where wildfire has occurred, seed beds should be located at a considerable distance from curing sheds, so that no infected leaves may find their way to the beds. The sterilization of tobacco seed with corrosive sublimate has not proved entirely satisfactory, nor has dusting and spraying of seed beds in Wisconsin given complete control.

Refined control methods for fruit disease (*Wisconsin Sta. Bul. 362 (1924), pp. 46, 47*).—As a result of continued investigations G. W. Keitt and L. K. Jones have found some important correlations between spore discharge and the time of infestation of apple scab and cherry leaf spot. Field and greenhouse studies of apple scab have shown that in Wisconsin orchards the spores of the scab fungus mature and are discharged considerably earlier in the spring than was formerly supposed. The addition of a prepink application of a suitable spray to the control measures previously recommended successfully checked early infections and led to satisfactory control.

Similar studies of cherry leaf spot showed that although the spores of the causal fungus are ordinarily matured before the blooming period, the early development of the disease in the Door County cherry section is so retarded by environmental conditions that it is unnecessary to apply the preblossom spray which was formerly considered essential.

Combating apple scab, W. L. DORAN and A. V. OSMUN (*Massachusetts Sta. Bul. 219 (1924), pp. 17*).—An account is given of spraying and dusting experiments conducted in 1923, together with a summary of the results of three years' work on the control of apple scab. Comparisons were made of dry lime sulphur, Bordeaux mixture, atomic sulphur, liquid lime sulphur, and copper dust, the fungicides being used in different proportions and at different times of application.

A spray schedule beginning with the pink application was found to control apple scab as well as one beginning with the prepink application. Sulphur dust controlled the disease satisfactorily when applied five times, beginning with the prepink preparation. Liquid lime sulphur 1:50 and dry lime sulphur 4:50 proved of equal efficiency. Less than 4 lbs. of dry lime sulphur in 50 gal. did not control scab quite as well as dry lime sulphur 4:50. The addition of calcium caseinate used as a spreader to the liquid sprays was followed by a slight decrease in the percentage of scabby fruit. Its addition to sulphur dust did not result in a decrease of scabby fruit as compared to sulphur dust used alone.

Since there was no injury to sprayed trees by a lime-sulphur lead-arsenate combination, it is not considered that the addition of lime to this spray reduced the toxicity of the fungicide. The use of lime sulphur throughout the spraying season gave as good control as where Bordeaux mixture was substituted in applications made before the flower buds opened. Atomic sulphur was found to control the disease as well as lime sulphur. Sulphur dust used throughout the season controlled apple scab as satisfactorily as when copper dust was substituted for the application before the flower buds opened.

[Effect of cold storage on apple scald] (*Iowa Sta. Rpt. 1923, pp. 46, 47*).—Experiments on the control of storage diseases of apple are reported in which the maturity of the fruit seemed to have an important part in the development of scald. Oiled wrappers containing 5 per cent of oil decreased the amount of scald on Grimes, but did not eliminate it entirely when fruit was picked somewhat prematurely and stored immediately. The experiments are said to show that the best treatment for Grimes apples is to pick the fruit when fully mature and wrap in oiled paper containing at least 15 per cent of oil by weight.

Experiments with Jonathan apples showed that Jonathan spot is best controlled by placing the apples in cold storage at 32° F. immediately after picking. Jonathan apples delayed one week before placing in cold storage had a considerable amount of soft scald, while those stored immediately had practically none. Fruit delayed two or three weeks before storing showed no soft scald.

Illinois blister canker (*Iowa Sta. Rpt. 1923, p. 47*).—In experiments for the control of blister canker carried on during 1922, it was found that after cutting out the cankers the wounds could be treated efficiently with a cheap roofing paint. The roofing paint used had a coal tar base, which is considered toxic to the blister canker fungus. Very little injury to the freshly cut bark by the use of the paint was observed.

The life history of the grape rootrot fungus Roesleria hypogaea Thüm. et Pass., A. M. Beckwith (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 8, pp. 609–616 pl. 1*).—As a result of studies of cultures of *R. hypogaea*, the cause of the root rot of grapes, the author established the fact that the fungus is an ascomycete and is in no way identical with *Coniocybe pallida* or *Pilacre petersii*, as has been repeatedly suggested.

"Dry rot" in buildings and building material, C. W. Edgerton (*Louisiana Stas. Bul. 190* (*1924*), *pp. 12, figs. 5*).—The author gives the results of a study of construction material in some of the buildings, including one at the university, at Baton Rouge. Dry-rot was found to be caused by the fungus *Poria incrassata*, and in the cases cited both cypress and heart pine were affected, the cypress showing no more resistance to the decay than did the pine.

For the control of dry-rot the author recommends the removal and burning of infected lumber from buildings, and in repairs substituting either concrete or brick, if possible, or where timber must be employed, the use of creosoted lumber or lumber painted with creosote.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Side lights on birds, H. K. Horsfield (*New York: D. Appleton & Co., 1923, pp. 224, pls. 19*).—An introduction to the study of bird life.

Instructions for banding birds, F. C. Lincoln (*U. S. Dept. Agr., Misc. Circ. 18* (*1924*), *pp. 28, figs. 28*).—This is a revision of and supersedes Department Circular 170, previously noted (E. S. R., 45, p. 148).

A check list of North American amphibians and reptiles, L. Stejneger and T. Barbour (*Cambridge, Mass.: Harvard Univ. Press; London: Humphrey Milford, 1923, 2 ed., rev.* [*and enl.*], *pp. X+171; rev. in Science, 59* (*1924*), *No. 1528, pp. 339, 340*).—This is a revised and enlarged edition of the list of 1917, previously noted (E. S. R., 39, p. 655), which recognizes 591 forms. It includes 100 additional forms, of which 71 have been described since the first list. The review is by A. G. Ruthven.

Invertebrate zoology, H. J. Van Cleave (*New York and London: McGraw-Hill Book Co., Inc., 1924, pp. XVI+259, figs. 126*).—Following an introductory chapter, in which the classification and reproduction of invertebrates are considered, chapters are devoted, respectively, to the phylum Protozoa (pp. 20–55), an introduction to the Metazoa (pp. 56–76), the phylum Porifera (pp. 77–81), the coelenterates and ctenophores (pp. 82–97), the phylums Plathelminthes (pp. 98–115), Nemathelminthes (pp. 116–124), and Trochelminthes (pp. 125–130), Coelhelminthes (Annelida) (pp. 131–143), Molluscoidea (pp. 144–149), Echinoderma (pp. 150–165), Mollusca (pp. 166–182), Arthropoda (pp. 183–203), Arthropoda (exclusive of Crustacea and Insecta) (pp. 204–213), Arthropoda (concluded) (pp. 214–230), and phylogeny (pp. 231–239).

Entomology (*Iowa Sta. Rpt. 1923, pp. 43, 44*).—Brief reference is made to the dusting of vine crops, Hessian fly control, control of the potato leafhopper, honey flow conditions, and queenless hives.

Common pests of field and garden crops, R. H. Pettit (*Michigan Sta. Spec. Bul. 132* (*1924*), *pp. 3–60, figs. 40*).—A summary is given of the more important insect enemies of field and garden crops.

[Report of insect investigations at the Ohio Station] (*Ohio Sta. Bul. 373 (1923), pp. 37–41*).—This report deals with a wheat insect survey (E. S. R., 46, p. 850), the occurrence of and work with the European corn borer, the bollworm, cabbage looper, and the apple flea weevil, an account of which latter pest has been noted (E. S. R., 51, p. 257).

[Report of the South Dakota Station] department of zoology-entomology, H. C. Severin (*South Dakota Sta. Rpt. 1923, pp. 22–25*).—Work with the common field cricket (*Gryllus assimilis* Fab.) led to the conclusion that a bait consisting of bran 25 lbs., white arsenic or Paris green 1.5 lbs., blackstrap molasses 1 gal., and water 3.75 gal. is the most effective and economical. Investigations of the life history and habits of the wheat stem maggot (*Meromyza americana* Fitch) have been completed in part, and a list is given of the cultivated and wild plants which it is known to attack and of its several natural enemies.

[Economic insect investigations in Wisconsin] (*Wisconsin Sta. Bul. 362 (1924), pp. 58–64, figs. 3*).—Control work with grasshoppers, by C. L. Fluke, has led to the adoption of a formula consisting of sawdust 85 lbs., white arsenic 5 lbs., salt 5 lbs., water to moisten, and shorts 15 lbs.

Investigations by H. F. Wilson and V. G. Milum have shown that, when colonies are wintered in a heavy packing case with 10.5 in. of packing around the hives or in a bee cellar where the temperature is fairly uniform, the bees live through the winter with relatively small losses and with but a small consumption of winter stores. Work by Milum showed that brood rearing in the early spring takes place at temperatures much below 93° F., which in the past has been considered the brood-rearing temperature. It was found that "brood-rearing activities continue to points even below 90°, but fluctuations below that point seem to retard the brood. High temperatures such as 96° or 97°, which are sometimes attained later in the season, are also undesirable because they increase the tendency of the colony to swarm." Work by Wilson seems to demonstrate conclusively that sodium hypochlorite is an effective remedy in destroying spores of foulbrood, provided the treatment is used for 24 hours or longer.

Reference is made to control work with the pea aphid, conducted by J. E. Dudley of the U. S. D. A. Bureau of Entomology, cooperatively. Examinations made of three red-winged blackbirds shot in a heavily infested field gave evidence that each contained undigested portions of 250 aphids. Observations in a large field containing both Admirals and Advancers varieties of peas indicate that Admirals are less susceptible to aphid injury than are the Advancers In the discussion of control measures, reference is made to several kinds of spraying booms tested, one of which was an 18-ft. triangular-shaped boom. A brief account is given of an aphidozer constructed by E. M. Searls, which effectively collected as high as 86 per cent of the aphids when the speed of the paddles was sufficient to brush the insects from the vines.

In control work with the leafhopper, by Fluke, the cost of dusting was found to be about the same as for spraying. Sprayed potato plats slightly outyielded dusted plats and the cost was less, but the method of applying the dust is simpler and more rapid.

The control of truck crop pests by dusting, E. N. Cory and S. F. Potts (*Maryland Sta. Bul. 261 (1924), pp. 121–155, figs. 17*).—This is a report of investigations, conducted in the fall of 1922 and the summer and fall of 1923, of the comparative effectiveness of commercial and homemade nicotin dusts for control of the pea aphid. Attempts were made to reduce the poundage per acre and the cost of the homemade dust, and to discover more efficient methods of application. Calcium cyanid was also tested on the pea aphid and several other insects, and nicotin dusts were used in combating the melon aphid, bean aphid, striped cucumber and asparagus beetles, and the garden flea hopper (*Halticus citri* Ashm.). Repellent and poison materials were used against the squash lady beetle. Much of the data is presented in tabular form.

In dusting operations in 1922 a power duster was used with a boom carrying eight nozzles, to which was attached a 10-ft. and later an 18-ft. trailer of heavy muslin. Of several insecticides tested, nicotin was found to be the most effective of dust applications. Temperatures above 70° F. and absence of or only light breezes gave the most favorable conditions for dusting. In the spring of 1923 dusting of peas was commenced about May 20, when most of the plants were in bloom. A very low kill was obtained with the exceedingly high rate of 80 lbs. per acre of 2 per cent dust without a trailer, while the same dust at 70 lbs. with an 18-ft. trailer gave 92 per cent kill. The low nicotin content, 1.5 and 2 per cent, failed to give a consistently satisfactory kill either with or without a trailer, and even with a 35-ft. trailer, which allowed 10 seconds fumgiation, 2 per cent dust failed. With a trailer in use, 4, 4.25, and 5 per cent dusts gave good results, and efforts to reduce the poundage per acre confirmed the results of 1922, that less than 30 lbs. per acre is not satisfactory. Home-mixed, high percentage dusts are less expensive than the commercial low percentage dusts and gave better results experimentally and from the growers' standpoint. The investigations led to the conclusion that less than 4 per cent nicotin dusts are not economical, since a kill of less than 90 per cent does not reduce the numbers of aphids sufficiently to insure freedom from injury. Thus, 4 to 5 per cent nicotin dusts should be used, at a rate of not less than 30 or more than 50 lbs. per acre, in dusting peas. Figures are presented which indicate that, at the rate of 30 lbs. per acre, the expense would be $4.21 per application for materials and labor.

Experiments with calcium cyanid dusts indicate that on some crops, under favorable conditions, cyanid can be used with good results. Control work with the melon aphid on cantaloups shows that relatively small amounts of low nicotin content dust are effective, 25 lbs. of 2 per cent dust from the sulphate source having given almost complete kill, at a cost of $2.26 per acre. One dusting is said to have been sufficient and measurably increased the yield and quality, besides prolonging the season. In limited tests with the bean aphid on bush Lima beans, excellent results were obtained with 40 lbs. of 8 per cent nicotin dust. The larvae of the asparagus beetle were controlled by the use of 2 per cent nicotin dust. A box fumigator devised by the junior author is illustrated.

Grasshopper control [trans. title] (*Dir. Gén. Agr. Com., et Colon.* [*Tunis*], *Bul. 27* (*1923*), *No. 114*, *pp. 229–247*).—This is a report of an international conference on control work held at Rome in October, 1920.

The camphor thrips, W. W. Yothers and A. C. Mason (*U. S. Dept. Agr. Bul. 1225* (*1924*), *pp. 30, pls. 6, figs. 7*).—This is an account of investigations conducted in Florida, where *Cryptothrips floridensis* Watson, which was first discovered at Satsuma in November, 1912, is now known to occur over all of the State except the extreme southern part. It is also known to occur in Alabama, Mississippi, and Louisiana, and probably in Georgia. Technical descriptions are given of the several stages of this pest, followed by an account of its life history and habits, much of the data relating to which is presented in tabular form. A discussion of control measures follows.

This thrips appears on camphor in enormous numbers when the trees are cut back to obtain wood for distillation and also when ornamental hedges are pruned back in conventional shapes. Its injury is not confined to pruned trees, but much more aggravated cases follow such treatments. The thrips collect in large numbers on the stubs of cut limbs and then attack the new shoots as soon as they appear. The buds which are attacked in the spring and at other times when new growth appears, become blackened and die back. Feeding also takes place along the limbs, with the result that the bark becomes blackened and cracks. Later these injured areas become enlarged by the thrips working down into the wood, even causing deformed limbs at times.

The species is probably of oriental origin, and camphor appears to be its only host plant. It reproduces rapidly, the life cycle being completed in about 20 days in summer and 40 days in winter.

A changed system of pruning the trees, cutting them off at the surface of the ground rather than dehorning or cutting away part of the limbs, is said to eliminate most of the damage and to be the most practical method of control. If applied at the proper time, good control can be obtained by spraying with a solution consisting of 0.5 lb. of 40 per cent nicotin sulphate, 2 qt. of potash fish-oil soap, and 2 qt. of lime sulphur solution, in 50 gal. of water. Infested nursery stock can be fumigated with sodium cyanid at the rate of 1 oz. to 100 cu. ft., with an exposure of 1 hour, with safety to the trees and absolute control of the thrips in all stages. Shellac is recommended for the cut ends of hedges.

A list of 12 references to the literature is included.

Thysanoptera known to occur in Canada, R. C. Treherne (*Canad. Ent., 56 (1924), No. 4, pp. 82–88, fig. 1*).—A list of the Thysanoptera occurring in Canada is followed by descriptions of three species new to science.

Calcium cyanide for chinch-bug control, W. P. Flint and W. V. Balduf (*Illinois Sta. Bul. 249 (1924), pp. 71–84, figs. 6*).—In extensive tests commenced in 1922 and continued through the season of 1923 in Illinois, it was found that 6-in. strips of cyanid (using either the dust or the granules in combination with creosote or coal-tar barriers), requiring about 1 oz. to a strip and laid at right angles to the barrier every 2 rods, under favorable conditions kill from 75 to 95 per cent of the bugs as they move along the barrier line. The cyanid is said to be very effective when dusted along the line of a coal tar or creosote barrier.

Dusting for leaf-hoppers (Empoa rosae L.) in bearing apple orchards, S. W. Frost and E. M. Craighead (*Jour. Econ. Ent., 17 (1924), No. 2, pp. 262–264, pl. 1*).—Field tests by the authors in Pennsylvania show that nymphs and adults of *E. rosae* can be readily killed by nicotin dusts. It still remains to be discovered whether one or two applications of nicotin dust during June will be sufficient to keep the hoppers under control.

A contribution to the study of the Aphididae of France, I [trans. title], L. Gaumont (*Min. Agr. [France], Ann. Épiphyties, 9 (1923), No. 5, pp. 309–346, pls. 31*).—This first part of the author's study discusses the external anatomy of aphids, the relation of the Aphididae to other Homoptera, and gives a general account of the biology of plant lice and of technique (pp. 310–321). This is followed by a historical account of the classification of Aphididae (pp. 322–329) and of the classification of the families and genera (pp. 330–346).

The migration of the Aphididae and the appearance of the sexual forms as affected by the relative length of daily light exposure, S. Marcovitch (*Jour. Agr. Research [U. S.], 27 (1924), No. 7, pp. 513–522*).—This is a contribution from the Tennessee Experiment Station, based upon investigations with the strawberry-root aphid, commenced in May, 1922. The author finds that plant lice and plants, as reported by Garner and Allard (E. S. R., 42, p.

818), appear to respond to the same stimulus as far as sexual reproduction is concerned.

"The exposure of strawberry plants bearing *Aphis forbesi* Weed to a short day of 7.5 hours, beginning May 23, 1922, resulted in the production of both males and oviparous females in abundance by September 18. In 1923 strawberry plants were given the same exposure at about the time the eggs were hatching, starting February 23. The first oviparous females were observed on May 7, and the first eggs were laid May 22. The normal appearance of the sexual forms of *A. forbesi* in Tennessee is in November. Conversely, under a long exposure, beginning September 4 out of doors, the sex forms of *A. forbesi* were inhibited from appearing, and viviparous reproduction was still taking place when examined December 3.

"The stimulus to migration of those plant lice having an alternate host was also found to be the relative length of day. By subjecting the secondary or summer hosts of several well-known migratory species, such as *A. rumicis* L., *A. sorbi* Kalt., and *Capitophorus hippohaes* Koch. to short days of about 7.5 hours, it was possible to produce the fall migrants and males in the latter part of May and early June. Oviparous females of *A. rumicis* matured on snowball June 20, at the hottest time of the year, when the days are longest. The normal appearance of the sexes of these species is the latter part of October and November. Ten generations of *A. sorbi* were produced on apple by June 12, with the possibility of many more, as the result of keeping the apple seedlings in the laboratory under subdued light and giving each generation a new plant. Winged forms appeared in each generation from the third to the tenth very sparingly, with no tendency to increase. The length of day with relation to the time of hatching appears to be an important factor influencing the early or late production of migratory forms."

The Coccidae of Jamaica, C. C. Gowdey (*Jamaica Dept. Agr., Ent. Bul. 1 (1921), pp. 46+III*).—Descriptions are given of 84 forms of Coccidae known to occur in Jamaica. A host plant list of Jamaican Coccidae is included.

Studies on typhus virus in the louse, F. Breinl (*Jour. Infect. Diseases, 34 (1924), No. 1, pp. 1–12, figs. 4*).—The author finds that with the method of injection of Weigl it is possible to pass the typhus virus from louse to louse repeatedly. The virus multiplies considerably within the louse, but does not become more virulent.

"Ten days after infection the intestines of a louse contain 100 doses of living virus. The body of the louse contains only small quantities of virus after the intestines have been removed. From this fact we can draw conclusions as to the way of natural infection in man. Lice fed on a patient one day after the fever had disappeared proved to be infectious seven days later. It is possible to infect lice with an emulsion of virulent guinea pig brain."

The poison and poison apparatus of the white-marked tussock moth, Hemerocampa leucostigma Smith and Abbot, P. M. Gilmer (*Jour. Parasitol., 10 (1923), No. 2, pp. 80–86, pls. 2, figs. 4*).—This is a report of investigations conducted at the Minnesota Experiment Station. The data presented have been summarized by the author as follows:

"The larva of the white-marked tussock moth, *H. leucostigma*, is truly venomous; its virulence ordinarily is not great but varies with individual susceptibility, very few persons being totally immune. This poisonous effect is due to the smaller white hairs, scattered over the body, chiefly on the lateral tubercles and on the dorsal plume tubercles of the first thoracic and last abdominal segments in the first two instars. They are particularly localized in the dorsal white tussocks on the first four abdominal segments in the later instars. These hairs retain their virulence after being shed, both in the co-

coons and in the shed larval skins. The poison is particularly resistant to chemical agents, being insoluble in all ordinary solvents. The virulence is increased by acids and decreased by alkalis of low concentration. It is resistant to both moist and dry heat. The urticating material can not be destroyed without dissolving out the protoplasmic content of the hairs. The poison is a product of a special gland cell communicating directly with the hair and independent of the trichogen or hair-forming cell."

A list is given of eight references to the literature cited.

The peach tree borer in New Jersey (with notes on similar pests), A. Peterson (*New Jersey Stas. Bul. 391 (1923), pp. 3–143, figs. 84*).—This bulletin presents the details of the author's investigations, extending over a period of several years, preliminary accounts of which have been previously noted (E. S. R., 48, p. 354; 50, p. 455). The subject is reported upon in three parts, the first of which (pp. 3–23) consists of an introduction and general information on the peach borer; the second (pp. 24–71) consists of a review of peach borer investigations in New Jersey and details of control experiments in the State from 1916 to 1923; and the third part (pp. 72–117) deals at length with paradichlorobenzene and its use and includes a brief general summary and recommendations. A bibliography of 88 titles and a subject index are included.

The author concludes that worming is quite satisfactory providing careful and thorough work is done. Of the numerous gases employed, paradichlorobenzene gave the best results, and, if properly applied, it will kill from 90 to 100 per cent of the borers, will have little or no effect upon most peach trees, and is a practical control measure. For orchard trees 1 and 2 years old, ¼ to ⅜ oz., respectively, will kill the borers in the trees if applied for three weeks when the soil temperature is from 55 to 70° F., although some injury may occur. Under some conditions, which are not entirely understood, serious injury occurs, but in most of the author's experiments and orchard observations little or no injury has taken place. Peach tree borers in nursery peach trees may be killed by an average dose of ¼ oz. of paradichlorobenzene per tree with an exposure of two or three weeks when the soil temperature averages 55 to 70°.

So far as observed, infested cherry and plum trees 6 years of age or older may be successfully and safely treated with short or probably long exposures of 1 oz. of paradichlorobenzene during the early fall. Apple trees and blackberry bushes should not be treated with paradichlorobenzene for the control of borers, for slight, considerable, serious, or fatal injury may take place with short or prolonged treatments with ½ or 1 oz.

Suppressing codling moth in eastern Washington, E. J. Newcomer and W. D. Whitcomb (*Better Fruit, 18 (1924), No. 10, pp. 5, 6, 20, 21, fig. 1*).—This is a contribution from the U. S. D. A. Bureau of Entomology.

Safeguarding the entry of freight cars from Mexico to prevent the entry of the pink bollworm, E. R. Sasscer (*Miss. State Plant Bd. Quart. Bul., 3 (1924), No. 4, pp. 1–10, figs. 7*).—This is a discussion of preventive work being undertaken by the Federal Horticultural Board, U. S. D. A.

The present status of the oriental fruit moth in northern Virginia, with report of recent orchard spraying experiments on its control, L. A. Stearns (*Virginia Sta. Bul. 234 (1924), pp. 28, figs. 10*).—This bulletin reports upon experiments conducted from 1921 to 1923, inclusive, and presents other information relating to the control and the present status of the oriental peach moth in northern Virginia. Other accounts by the author have been noted (E. S. R., 46, pp. 659, 750; 51, pp. 159, 359).

"Experimentally, it was discovered, first in laboratory tests, that nicotin sulphate 40 per cent (Blackleaf 40) as a contact spray and by reason of the gas evolved is decidedly toxic in respect to the eggs and hatching larvae of the moth. Later, in spraying some 40 acres of orchard, it appeared that the addition of this material at the dilution of 1 to 800 to the usual treatments on peach increased the spray efficiency from 8 to 14 per cent in the case of this particular insect."

Earthworms and the cluster fly, T. D. A. COCKERELL (*Nature [London], 113 (1924), No. 2832, pp. 193, 194*).—The author calls attention to the fact that this fly, which was introduced into the United States many years ago, has become abundant in Colorado since the introduction of European types of earthworms with plants. At Longmont, Colo., the species has become a veritable plague.

A new cotton pest, J. H. SIMMONDS (*Queensland Agr. Jour., 21 (1924), No. 3, pp. 187–191, figs. 4*).—A brief account of the chrysomelid beetle *Rhyparida australis* Boh.

Preliminary report on early poisoning in boll weevil control, T. F. MCGEHEE (*Miss. State Plant Bd. Quart. Bul., 3 (1923), No. 3, pp. 1–15, figs. 3*).—"The method of early poisoning used in the experiments described in this paper seems very promising, but it should be regarded as still in the experimental stage. The theory is good, and, if future tests should demonstrate its value conclusively, it will probably become one of the most popular control measures for the weevil. The fact that equally good results were obtained with the molasses mixtures and the calcium arsenate dust is a good point. Where labor is cheap and the acreage is small the liquid poison may be preferred, but in most cases the calcium arsenate dust will be cheaper, as considerable labor is necessary in applying the liquid poisons."

Introduction of parasites of the alfalfa weevil into the United States, T. R. CHAMBERLIN (*U. S. Dept. Agr., Dept. Circ. 301 (1924), pp. 9, figs. 5*).—Reporting upon parasite work with the alfalfa weevil, it is stated that 12 species of parasites of this weevil have been introduced from Europe into the United States, of which 10 have been liberated in Utah. Five of these are said to show promise of practical results, and 1 of the 5, namely, *Bathyplectes curculionis* Thoms., has become established in this country and has spread so rapidly that it has overtaken the weevil, which started to spread from the same point about 10 years earlier. *B. curculionis* has increased in numbers until it now actually swarms in the infested fields of Utah and destroys over 90 per cent of the weevil larvae in the older sections, much surpassing its effectiveness in any of the localities studied in Europe at the time of the importations, where the highest local average of parasitism by all the species of parasites which attacked the larvae was 12.5 per cent.

FOODS—HUMAN NUTRITION.

The rôle of bread in nutrition, W. HALE (*Indus. and Engin. Chem., 15 (1923), No. 12, pp. 1221–1224, figs. 5*).—The results are reported of feeding experiments conducted on young rats and mice, using various commercial and experimental breads as the sole diet.

In the preliminary tests with commercial breads two whole wheat and two white breads were used. One of each of these contained additional calcium. The best results were obtained with whole-wheat bread containing calcium, followed in decreasing order by the other whole-wheat bread, the white bread containing calcium, and the other white bread. In no case was growth normal nor were any litters reared.

In a second series five commercial breads (three whole wheat and two white) and one experimental white bread made with milk and an aqueous extract of wheat embryo were used. In this series the experimental white bread proved superior to others, while the two commercial white breads were better than the two whole-wheat breads.

Three experimental white breads were then tested. One of these contained 4 per cent of dried whole-milk powder and an aqueous extract of wheat embryo, another these ingredients plus 8 per cent of peanut protein, and a third the same ingredients with 6 per cent of dried milk. All of these breads, while not causing as good growth as was obtained on a normal diet, gave much better results than the commercial breads.

A special study was made of one commercial white bread made with whole milk, extract from wheat embryo, and added calcium. On this the animals made practically as good growth as on a normal diet. The superior nutritive value of this bread was also shown by a comparison of the growth records of two selected groups of children in a children's home. The diets of these two groups differed only in that one group received an ordinary white bread and the other the special bread. At the end of nine months eight boys on the ordinary white bread had gained a total of 4.26 lbs. more than the expected gain at this age and the similar group of seven boys on the special bread had gained 6.33 lbs. more than the expected gain. The girls in both groups made larger gains than the boys. Of the group of seven on ordinary white bread each gained 2.28 lbs. more than the expected average, while of the group of eight on the special bread each averaged 2.46 lbs. greater gain.

Panary fermentation, C. B. Morison (*Indus. and Engin. Chem.*, *15* (*1923*), *No. 12*, *pp. 1219–1221*).—This is a general review of some of the biochemical changes taking place in bread dough during fermentation and of the effect of various factors on these changes.

Report of the Food Investigation Board for the year 1922, W. B. Hardy et al. ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1922*, *pp. III+60*).—This annual report of the Food Investigation Board of Great Britain consists of summaries of the results of investigations which have been conducted during 1922 by the various committees as listed in the note on the previous report (E. S. R., 49, p. 753). Much of this work has been noted from other sources.

Recent work in anatomy, physiology, and pathology of infancy and childhood, J. B. Holmes (*Amer. Jour. Diseases Children*, *27* (*1924*), *No. 3*, *pp. 260–295*).—Among the subjects treated in this review of recent progress in pediatrics are infant feeding, metabolism, nutrition, and the treatment of juvenile diabetes with insulin.

Are the nutritive needs of both sexes identical during growth? [trans. title], H. Simonnet (*Compt. Rend. Acad. Sci.* [*Paris*], *178* (*1924*), *No. 2*, *pp. 235–237*, *fig. 1*).—This is a further note on the difference in the growth rate of male and female rats on a diet deficient in vitamin A (E. S. R., 48, p. 863). Curves are given representing the arithmetic mean of the growth rate of four male and four female rats, respectively, on such a diet. Starting at the same weight at 30 days, the growth of the males was increasingly more rapid than that of the females up to about the sixtieth day of the experiment. Beyond this time the weight of the males remained nearly constant for a considerable period and then dropped suddenly, while that of the females decreased more steadily from the point of maximum weight. Other points of difference were an earlier appearance of xerophthalmia and a shorter survival period in the females than in the males.

The association of manganese with vitamins, J. S. McHargue (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 6*, *pp. 417–424*, *pl. 1*).—In this contribution from the Kentucky Experiment Station, which has been noted briefly from a preliminary report (E. S. R., 50, p. 463), the author has attempted to correlate the occurrence of manganese and vitamins in plant and animal tissues. It is first shown that in the milling of barley, wheat, and rice, which processes decrease the amount of vitamin B, the greater part of the manganese is removed in the bran and polishings. From a study of the content of manganese in various organs of the hog, sheep, and steer it is shown that the liver contains about twice as much manganese as any other organ, followed in decreasing order by the kidneys, pancreas, brain, heart, and lean meat. Fish roe, which is rich in vitamins, contains manganese to the extent of about 3 parts per million. A sample of first colostrum contained 20 parts of manganese per million of the ash, while milk from the same cow a month later contained only 4 parts, a decrease similar to that of vitamin A. Egg yolk contained 2.72 parts of manganese per million in the moisture-free material and egg white no manganese. Tomatoes, oranges, and lemons were found to contain appreciable amounts. All these results are thought to point to a relationship existing between manganese and vitamins in plant and animal tissues.

The distribution of vitamin A in urine and some of the digestive secretions, E. Cooper (*Amer. Jour. Physiol., 67* (*1924*), *No. 3, pp. 454–463, figs. 4*).—Feeding experiments with rats are reported, the results of which demonstrate that on diets very rich in vitamin A the urine of man and the dog contains an appreciable amount of this vitamin, but that on ordinary diets and in prolonged fasting the urine is practically free from vitamin A. Pure gastric juice obtained by means of a Pavlov pouch from dogs on high vitamin A diets contained vitamin A, but the gastric juice of man and the dog on ordinary diets appeared to be free from this vitamin. No evidence could be obtained of the presence of vitamin A in human saliva or in pancreatic juice.

"It seems probable that the kidneys and the digestive glands have a 'threshold' limit for vitamin A retention in the body. When the body is flooded with this vitamin by an excess in the diet, the absorption is faster than the storage and destruction, there follows a rise of the vitamin concentration in the blood, and consequent vitaminuria and overflow into some of the digestive secretions. Since a considerable part of the vitamin A in milk seems to be in solution outside the milk fat, the threshold limit for vitamin A overflow in the mammary gland is either relatively low or else we are dealing with a true vitamin A secretory process in this gland."

Vitamin studies.—X, Feeding technique in vitamin studies, R. A. Dutcher and E. Francis (*Soc. Expt. Biol. and Med. Proc., 21* (*1924*), *No. 4, pp. 189–193, fig. 1*).—The work reported in this paper, continuing the series previously noted (E. S. R., 47, p. 78), corroborates the previous conclusion of Steenbock, Sell, and Nelson (E. S. R., 49, p. 665) that rats which have access to their excreta obtain sufficient vitamin B to grow satisfactorily for many weeks on a vitamin B-deficient ration. Representative curves are given of the growth of rats on vitamin B-deficient diets when kept in cages with and without screens and also of rats fed feces from animals on diets rich and deficient in vitamin B. The latter show that rats are limited in their ability to store vitamin B.

Experiments with two methods for the study of vitamin B, H. C. Sherman and H. Edgeworth (*Jour. Amer. Chem. Soc., 45* (*1923*), *No. 11, pp. 2712–2718*).—A comparison is reported of the reliability of the gravimetric yeast-growth method of Williams (E. S. R., 48, p. 614) and the rat-growth method for the quantitative study of the growth-promoting water-soluble vitamin B. In all of the experiments skim-milk powder was used as the source of vitamin B.

In the yeast-growth studies parallel tests were made with medium+yeast, medium+yeast+milk powder, and medium+milk powder, and the amount of yeast growth due to the milk powder was calculated by subtracting the increase in weight in the two control tests from the gross weight in each test. The average results of 200 quantitative tests by this method are reported, with calculations of the probable errors. The latter were in all cases less than 2 per cent and in most cases less than 1 per cent of the numerical values.

The acceleration of the growth of the yeast as the result of the addition of the milk powder increased with increasing amounts of milk up to about 0.4 gm. This amount was used in a further study of the effect of heat upon vitamin B, but the results obtained by heating the milk at 100° for from 12 to 48 hours varied too little to warrant any conclusions as to the possible heat destruction of vitamin B at this temperature.

Since the method employed is open to the objection that the increased growth of yeast resulting from the addition of the milk may have been due to the introduction of other substances favorable to the growth of yeast, an attempt was made to use the more complete medium of Fulmer, Nelson, and Sherwood (E. S. R., 45, p. 565), but this method did not prove adaptable to gravimetric measurement.

In the rat-growth experiments the skim-milk powder, unheated and heated at 100° for varying periods of time, was fed at a 40 per cent level in a diet consisting otherwise of starch 50, butter fat 9, and sodium chlorid 1 per cent. In all cases the rats were from 28 to 30 days old at the beginning of the experiment and were grouped as closely as possible in size and distribution of sexes. The animals were weighed weekly and the feeding trials continued for eight weeks. The experiments were carried out in three series, (1) in the autumn of 1920, (2) in the summer of 1921, and (3) in the autumn of 1921. The number of rats, average gain in grams, and probable error for each series were as follows: 11, 125, and ±4; 39, 92, and ±2.2; and 14, 99, and ±2.9.

In the experiments in which heated milk was used there was a decrease in the food consumption, accompanied by slower growth, with increasing periods of heating. The authors are inclined to attribute the decreased intake of food, in part at least, to the cooked flavor of the heated milk rather than to a lowered vitamin content of the milk. In experiments reported in the following paper under more perfectly controlled heat treatment the flavor of the milk was not changed, the food was eaten more uniformly, and the differences in gain in weight disappeared.

The general conclusion drawn is that "while the rat-growth method involves somewhat larger probable errors than the gravimetric yeast-growth method as here used, the results can be interpreted in terms of vitamin B with much greater certainty and we, therefore, consider the use of the growing rat to be the preferable method."

A quantitative study of the destruction of vitamin B by heat, H. C. SHERMAN and M. R. GROSE (*Jour. Amer. Chem. Soc., 45 (1923), No. 11, pp. 2728–2738, figs. 5*).—This investigation was conducted along the same general plan as that of the previous study, using the juice of canned tomatoes as the source of vitamin B.

A preliminary study of the content of vitamin B in unheated tomato juice showed that 10 cc. daily was about as much as the animals would consume, and that this was not sufficient for normal growth. For this reason a dosage giving approximate maintenance was selected as the best level of feeding. This proved to be between 4 and 5 cc. of unheated juice. The amounts were then determined of the juice heated for 4 hours at varying temperatures which would give the same growth curves as the 4 cc. of unheated juice, and from these results the percentage heat destruction at the varying temperatures was calculated. These were found to be at 100° 20 per cent, at 110° 33, at 120° 47, and at 130° 55 per cent.

"These figures establish a low temperature coefficient of heat destruction as one of the characteristics of vitamin B, a property possessed also by vitamin C, as shown by the previous experiments of Delf and of La Mer, Campbell, and Sherman [E. S. R., 46, p. 865]. For an increase of 10° in the temperature range of 100 to 130°, the rate of heat destruction of vitamin B in solutions such as here studied is increased only 1.3-1.4-fold, as compared with a 2-fold increase in most chemical reactions."

It is pointed out in conclusion that there was no indication of an increased temperature coefficient at temperatures around 120°, and that in this respect the heat destruction of the vitamin does not resemble the heat coagulation of typical proteins nor the heat destruction of typical enzyms.

Do cooking methods affect vitamine content of peas? (*Wisconsin Sta. Bul. 362 (1924), pp. 89, 91*).—A brief report is given of studies conducted by H. T. Parsons on the vitamin B content of early June peas prepared in various ways. Peas canned by the regular canning process, while not valueless as a source of vitamin B, contained a smaller amount of this vitamin than the same variety cooked by steaming and subsequently dried. The juice of the canned peas was not rich enough in vitamin B to account for the difference.

Vitamin C in canned foods, W. H. Eddy and E. F. Kohman (*Indus. and Engin. Chem., 16 (1924), No. 1, pp. 52, 53, fig. 1*).—This is a report of the first of a series of studies undertaken to determine the extent of the destruction of vitamin C in commercial canning processes. Cabbage was canned in No. 2 cans by the ordinary commercial method, with different times and temperatures of processing, and the contents then used in feeding tests on guinea pigs according to the method established by Sherman, La Mer, and Campbell (E. S. R., 46, p. 865). As controls, one group of guinea pigs received the basal diet alone and another the basal diet with 1 gm. of raw cabbage daily. The former died in about 30 days, and the latter grew normally and was still free from scurvy at the end of 80 days. It is noted, however, that animals receiving raw cabbage which had been stored for about 6 weeks were no longer protected against scurvy, thus pointing to a destruction of vitamin C on storage. As an additional control the growth curves are given of a group of guinea pigs receiving 20 gm. daily of cabbage cooked in an open kettle for 45 minutes at 100° C. As noted in a previous paper by Eddy et al. (E. S. R., 47, p. 466), 20 gm. was the minimum amount for protection in the case of cabbage thus cooked.

Of the canned cabbage, the animals were first fed 40, 30, and 20 gm. daily. Weighed on the raw basis, these amounts all proved in excess of the amount needed for protection, and at the end of 40 days the 40 gm. series was changed to 15 gm. At the end of 80 days all of the animals were growing actively, and there was no evidence of scurvy on autopsy.

In a second series of experiments 5, 10, and 15 gm. amounts daily of cabbage processed 60 minutes at 100°, 45 minutes at 115°, and 30 minutes at 126° were used. At the end of 46 days growth was still normal, and the autopsied animals showed no trace of scurvy.

In the final series 2, 4, and 8 gm. amounts of cabbage processed 30 minutes at 115° and 30 minutes at 100° were used. In this series 2 gm. proved inadequate, 4 gm. close to the protective limit, and 8 gm. completely protective.

These results are thought to justify the feeding of canned cabbage as an antiscorbutic on a ratio of 4:1 of raw cabbage.

Canned cabbage rich in vitamins, E. F. Kohman (*Canner, 58 (1924), No. 12, pp. 23, 24*).—A popular discussion of the investigation noted above.

Uric acid and allantoin metabolism in avitaminosis [trans. title], A. ADACHI (*Biochem. Ztschr., 143 (1923), No. 5–6, pp. 408–422, figs. 3*).—Metabolism experiments were conducted on three dogs to determine whether there are any changes in the output of uric acid and of allantoin on a vitamin-free diet. No great disturbances in the allantoin metabolism were noted. The excretion of uric acid, while irregular, tended to increase with prolonged feeding on the vitamin-deficient diet. This is thought to point to disturbances in the endogenous purin metabolism and to an increased consumption of nucleins in the later stages of avitaminosis.

The effects of vitamin deficient diets on rats, with special reference to the motor functions of the intestinal tract in vivo and in vitro, L. GROSS (*Jour. Path. and Bact., 27 (1924), No. 1, pp. 27–50, figs. 4*).—The main object of this investigation was to determine whether or not pure vitamin deficiencies can be a source of intestinal stasis. Incidentally observations were made on the general anatomical changes resulting from vitamin deficiencies. The diets used and many of the experimental rats were the same as in the previously reported study of the effect of vitamin-deficient diets on the adrenalin equilibrium in the body (E. S. R., 50, p. 668). As in the earlier study, the animals were examined before the final stages of avitaminosis in order to avoid the complicating effects of the last stages of inanition.

Observations were first made on the gross and microscopic findings in various organs of 48 apparently normal rats. Although none of these animals, with the exception of 2 which developed mastoiditis, showed clinical evidence of morbidity, there was evidence on autopsy of gross inflammation of the lungs in 31 per cent and moderate variations in size in the thyroid, liver, spleen, and thymus. Microscopically there was evidence of acute inflammatory lesions of the thyroid in 4 per cent, of the lungs in 65 per cent, of the livers in 23 per cent, of the pancreas in 5 per cent, and of the ileocecal glands of the intestines in 61 per cent of the animals examined. Slight abnormalities in the testes and ovaries were noticed in many cases. These findings are thought to emphasize the necessity of making a preliminary study of controls before drawing conclusions concerning the changes in animals on deficient diets.

On the vitamin-deficient diets the 19 rats fed on the A-deficient diet showed no clinical evidences of deficiency for about 4 weeks, when many of them became affected with colds. At about the same time there was a drop in weight. The 34 rats on the B-deficient diet showed the usual clinical symptoms of loss of appetite and weight and decline in temperature, followed by weakness and incoordination of the limbs. The 20 rats on the C-deficient diet showed no clinical symptoms beyond an elevation in temperature, with slight loss in weight after the first few weeks. The length of time the animals were kept on these diets was about 6 weeks for the A-, 5 for the B-, and 7 for the C-deficient diets.

The gross observations made on the various organs at the close of the experiment showed the same variability as in the normal animals with respect to the thyroid, heart, kidney, and striated muscle. The livers of the animals on the B-deficient diet showed slight, and the thymus marked, atrophy. The spleen appeared atrophied in a number of cases on all diets, most notably on the diet deficient in vitamin B. The lungs showed gross lesions in 63 per cent of the A-, 23 per cent of the B-, and 42 per cent of the C-deficient animals. Enlarged retro-ileocecal glands were found in 37 per cent of the control, 23 per cent of the A-, 38 per cent of the B-, and 20 per cent of the C-deficient animals. Aside from more gas in the intestines of the vitamin A-deficient animals, there were no striking differences between the normal and vitamin-deficient animals in the gross appearance of the alimentary tract.

On microscopic examination the rats on the A-deficient diet showed some form of lung lesion in every case, with acute lesions in 74 per cent, congestion of the liver and kidneys, slight abnormalities in the spleen, and atrophy of the testes in 60 per cent, and degeneration of the Graafian follicles of the ovary in 80 per cent. The intestines showed no marked changes.

In the rats on the B-deficient diet the thyroid glands showed on microscopic examination some irregularity in cell arrangement, the liver a hyalin appearance of the cells, the kidney cloudy swelling, the spleen bloody atrophy, the pancreas increased incidence of vacuolation, and the testes atrophy in 61 per cent, and the ovaries degeneration of the follicles in 75 per cent.

The microscopic changes noted following C deficiency were vacuolation of the pancreas in 43 per cent, atrophy of the testes in 50 per cent, and degeneration of the Graafian follicles of the ovary in 75 per cent.

The effects of vitamin-deficient diets on the motor function of the intestinal tract were studied by the simple means of feeding 1 gm. of the diet in question with 5 mg. of finely divided animal charcoal, placing the animals in a specially designed metabolism apparatus which automatically times and separates the excreta, and noting the length of time necessary for the first appearance and disappearance of charcoal in the feces. The experiments with the vitamin-deficient diets were preceded and followed by control experiments on normal diets. The average time taken for the charcoal to appear was 10 hours for all the diets, while the time taken to disappear was increased in some cases to 16 days on the B-deficient diet. This time could be shortened by the administration of marmite or other substances containing vitamin B. This is thought to prove that vitamin B is essential for the maintenance of the normal motor functioning of the intestines and to suggest that the well-known laxative action of yeast is due to its content of vitamin B. Lack of vitamin A on the contrary shortened considerably the time required for the disappearance of the charcoal. The effects of vitamin C deficiency were not studied.

An attempt was also made to determine whether there was any difference between the work done by the isolated intestine from the vitamin-deficient rats and that from normal controls by means of tracing the rhythmic movement in Tyrode's solution at 39° C. of slips of intestine taken immediately after death and kept on ice until used. The work done was calculated from a formula involving the weight of the rat. The results as thus calculated are thought to indicate that "vitamin deficiencies on the whole diminish this power in the first part of the small intestine and alter the relations of the dynamic gradient. This must be an index of either atrophy or other qualitative changes in the muscular or neuromuscular apparatus."

The author states in conclusion that "whether vitamin deficiencies play a rôle as an etiological factor of some forms of intestinal stasis in everyday life is not a matter which I desire to discuss here. Personally, I am inclined to believe that they do, and sufficient evidence has been produced in this paper to make the consideration of vitamin B deficiency an important factor in the prevention of this condition, especially since more attention is being paid to vitamins A and C as etiological factors of morbid conditions met with in everyday life. If it should turn out that the present so-called vitamin B corresponds to more than one factor, as has recently been suggested by a number of observers, I can not predict in which factor the 'antistasis' element will be found."

On the pharmacological action of the antirachitic active principle of cod liver oil, T. F. Zucker and M. J. Matzner (*Soc. Expt. Biol. and Med. Proc., 21 (1924), No. 4, pp. 186, 187*).—It is noted briefly that the feces of rats on the Sherman-Pappenheimer rickets-producing diet 84 gave in water suspension a pH value of 7.4 to 8, but that when the same rats were given the active principle of cod liver oil prepared as previously described (E. S. R., 49, p. 608), or cod liver oil itself, the reaction of the feces changed in a few days to the acid side (pH 6.2 to 5.7). Controls with cottonseed oil had no such effect, nor had the subcutaneous injection of the active principle in glycerol or olive oil.

Similar evidence was obtained that the rickets-curing effect of light is associated with an increase in H-ion concentration of the gastrointestinal tract. Rats on diet 84 exposed to a moderate amount of sunlight gave a feces reaction of about pH 6.7, while others in which rickets had been completely prevented by treatment with the mercury vapor lamp had a feces reaction of about pH 6.4.

On the effect of hematoporphyrin on the deposition of calcium in the bones of rachitic rats, E. C. van Leersum (*Jour. Biol. Chem., 58 (1924), No. 3, pp. 835–844, pls. 3*).—As demonstrated by the line test described by McCollum (E. S. R., 47, p. 566), the injection into rachitic rats of the light-sensitizing substance hematoporphyrin is followed by a more rapid deposit of calcum in the metaphysis.

Studies of diabetes mellitus.—I, Respiratory exchange following the ingestion of glucose, glycerol, calcium hexose phosphate, and calcium glycerophosphate, W. S. McCann and R. R. Hannon (*Bul. Johns Hopkins Hosp., 34 (1923), No. 385, pp. 73–80*).—This paper reports the results of a comparative study of the effects on the respiratory exchange in normal and diabetic subjects of the ingestion of glucose and of the calcium hexose phosphoric ester, and a similar comparison of glycerol and the glycerophosphates of calcium and sodium. The determinations were made in the morning before breakfast. Observations of the basal respiratory exchange were first made, and the subjects were then given the material under investigation in a cup of Kaffee Hag. The respiratory exchange was observed from 40 to 50 minutes and again from 100 to 140 minutes after the ingestion of the various substances.

Two types of response to the ingestion of glucose were observed in the diabetic subjects, a decrease and an increase in the respiratory quotient. The subjects of the first type responded readily to treatment, while those of the second did not respond to treatment with a maintenance diet low in protein and balanced as to ketogenic and antiketogenic factors. Similar changes in the respiratory quotients of the diabetic subjects who ingested glycerol were obtained, but in normal subjects there was no parallelism between the effects of glycerol and glucose.

In the diabetic subjects of the first type, hexose from the phosphoric ester was oxidized more readily than glucose. Hexose phosphate ingestion caused a steady rise in respiratory quotient in both diabetic and normal subjects.

The effect of the ingestion of calcium glycerophosphate was variable, but in three diabetic subjects of the first type the respiratory quotients rose more readily than when glycerol was taken alone.

The difference in results obtained with glucose is thought to indicate that there are differnt types of diabetes corresponding to different mechanisms at fault.

Clinical calorimetry.—XXXIV, Ketosis and the respiratory exchange in diabetes, H. B. Richardson and W. S. Ladd (*Jour. Biol. Chem., 58 (1924), No. 3, pp. 931–968, figs. 2*).—This continuation of the series of studies previously noted (E. S. R., 50, p. 766) is concerned chiefly with the following questons: (1) In what proportions must foodstuffs be oxidized by the diabetic in order to prevent ketosis? (2) To what extent is ketosis affected by changes in the diet? (3) What is the effect of fasting on ketosis and on the carbohydrate metabolism? The calorimetric data were obtained by the method described in the previous paper on nine diabetic subjects whose case histories are given.

The fatty acid-glucose ratio calculated from the data obtained with the respiration calorimeter was parallel with the excretion of acetone bodies. The threshold of ketosis, which is defined as the excretion in the urine in 24 hours of 1 gm. or more of acetone bodies expressed as acetone, was found near a ratio of 1.5:1, which corresponds theoretically to the presence during oxidation of one molecule of keto-acid for every molecule of glucose. An explanation of the fact that diabetic patients are sometimes able to take diets containing a larger proportion of ketogenic substances than called for by this ratio without developing ketosis is furnished by some of the data reported, which indicate that in such circumstances more fat is ingested than is actually oxidized. This shows that the diet can not always be relied upon as a basis for calculating the ketogenic balance.

The fall in ketosis sometimes following fasting is explained as being due primarily to a decrease in the total metabolism, with a consequent diminution in the metabolism of fat and protein.

Some changes in the composition of blood due to the injection of insulin, A. P. Briggs, I. Koechig, E. A. Doisy, and C. J. Weber (*Jour. Biol. Chem., 58 (1924), No. 3, pp. 721–730, fig. 1*).—Analyses are reported of the blood of dogs before the injection of insulin, during the period of depression following large doses of insulin, and during the hyperirritable stage, but before the onset of convulsions. The determinations included lactic acid by the Clausen method (E. S. R., 47, p. 716), glucose by the Shaffer and Hartmann method (E. S. R., 45, p. 111), carbon dioxid and oxygen by the Van Slyke and Stadie method, and inorganic elements in the blood plasma by the Briggs method (E. S. R., 50, p. 615).

Insulin was found to cause a decrease in the concentration of glucose, inorganic phosphate, and potassium in the blood, with an increase in lactic acid. This is thought to indicate that insulin influences the reversible reaction glucose⇌lactic acid in the direction of lactic acid, and that glucose is formed in diabetic animals because of the absence of this influence.

Diabetes and insulin, J. A. Nixon (*Brit. Med. Jour., No. 3289 (1924), pp. 53–55*).—This paper deals largely with the dietary control of diabetes in connection with the use of insulin. A working basis for the diets recommended is Woodyatt's basal requirement diet. Tables are given of the amounts of different foods that can be used in the various groups. Specimen 1,680 calorie diets and a list of vegetables in the 5 and 10 per cent group are included.

The diabetic diet, W. T. V[aughan] (*Jour. Lab. and Clin. Med., 7 (1922), No. 11, pp. 694–700*).—An editorial discussion of the theories involved in the various dietary treatments of diabetes.

ANIMAL PRODUCTION.

The relation of vitamins to disease resistance (*Iowa Sta. Rpt. 1923, p. 35*).—The results of experiments with rats, rabbits, guinea pigs, and pigeons indicate that the resistance of rats, rabbits, and pigeons to anthrax and pneumonia infections is lowered when they are receiving vitamin A or vitamin B deficient rations. Similar results were found with guinea pigs in the case of vitamin C deficiencies. Vitamin deficiency does not seem to injure the mechanism elaborating antibodies, but there is a marked drop in body temperature, followed by subnormal phagocytic activity.

The deficiencies of whole oats (*Ohio Sta. Bul. 373 (1923), pp. 57, 58*).—Nutrition studies of whole oats by means of rats indicated that this grain is deficient in minerals, essential proteins, and vitamin A. Supplementing oats with tankage and fish meal supplied the minerals and proteins, but for normal growth it is still necessary to supply vitamin A by means of such materials as cod liver oil or alfalfa leaves. Soy beans were also found to supply the deficient proteins.

Digestion experiments with oat by-products and other feeds, G. S. Fraps (*Texas Sta. Bul. 315 (1924), pp. 3-12, fig. 1*).—The composition, coefficients of digestibility, and productive values are given for the 12 feeds listed in the table below, which were determined by the method described in Bulletin 185 (E. S. R., 35, p. 561).

Composition and digestibility of various feeds.

Feed.	Composition.						Coefficient of digestibility.				Productive value.
	Water.	Protein.	Crude fiber.	Ether extract.	N-free extract.	Ash.	Protein.	Ether extract.	Crude fiber.	N-free extract.	
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Therms.*
Alfalfa meal	7.82	17.19	22.76	1.84	41.00	9.39	74.90	20.10	43.10	73.70	43.04
Do	6.85	10.98	35.06	1.67	38.82	6.62	71.10	50.50	49.50	68.20	35.55
Corncobs	6.41	3.25	34.93	.33	53.31	1.77	....	1.40	52.40	43.60	23.55
Do	8.30	2.90	34.26	.30	52.71	1.53	....	59.10	56.40	48.70	27.87
Cottonseed hulls	8.78	3.42	48.60	.68	36.16	2.36	....	92.90	52.50	71.02	26.97
Cottonseed meal fed with alfalfa	6.33	42.97	11.52	6.62	26.37	6.19	80.65	100.00	38.32	73.15	70.77
Cottonseed meal fed with hulls	6.33	42.97	11.52	6.62	26.37	6.19	73.30	94.70	53.50	53.30	62.94
Kafir head stems	8.02	6.73	19.61	.99	56.72	7.93	20.18	52.90	33.11	58.40	33.15
Mesquite beans	5.39	12.89	27.49	1.92	47.52	4.79	90.41	95.30	58.90	81.29	57.79
Oats, low grade	8.53	11.14	16.92	4.61	54.96	3.84	71.00	92.40	60.50	82.00	66.77
Oat hull clippings	8.05	8.75	24.39	2.34	46.27	10.20	39.51	76.35	55.80	57.59	32.30
Do	7.40	8.70	24.66	2.46	46.74	10.04	37.53	77.40	55.90	61.26	38.30
Oak leaves, live oak	6.23	9.28	29.93	2.66	45.30	6.60	....	29.70	10.42	26.90	....
Oatmeal by-products	6.08	6.46	28.89	1.89	50.87	5.81	50.98	82.75	29.63	40.64	20.89
Rice bran	7.60	13.21	15.91	13.86	37.64	11.78	76.20	89.04	32.31	68.32	65.65
Rice polish	8.66	13.42	2.73	9.42	59.92	5.85	75.00	88.21	8.20	94.32	92.24

Experiments with silage (*Wisconsin Sta. Bul. 362 (1924), pp. 75, 76*).—Moldy silage has been found to be due to the ensiling of too ripe crops which are not sufficiently packed. The oxygen is not taken up quickly enough by respiration of the plant tissues to prevent the growth of molds.

In a silage fermentation test by E. G. Hastings, E. B. Fred, and W. H. Peterson, it was found that the oxygen was nearly all consumed within two or three hours. There was a corresponding increase in the carbon dioxid, which is gradually replaced by nitrogen as the oxygen is removed from the normal air by the growth of the molds on the surface.

The preparation of alfalfa silage according to the method of Samarani (E. S. R. 47, p. 865) was investigated by Fred and Peterson with fairly satisfactory results. The material, which was dried to a 30 to 40 per cent water content, was tightly packed and heavily weighted in a silo. It was found that the silage produced was of a brownish-green color, having a pleasant odor and being readily eaten by cattle. The essentials for the successful production of silage by this method seemed to be the reduction of water to prevent bacterial growth, and the retention of sufficient living tissue to remove the oxygen.

Inspection of feeds, J. B. Smith and W. L. Adams (*Rhode Island Sta. Ann. Feed Circ., 1924, pp. 12*).—This is the usual report of feeding stuffs inspections (E. S. R., 49, p. 870), giving the guaranteed and found protein and fat content of the feed officially analyzed.

Fattening steers in the Corn Belt, W. H. Black (*U. S. Dept. Agr., Farmers' Bul. 1382 (1924), pp. II+18, figs. 7*).—This is a practical discussion of the recommended methods of fattening steers in the Corn Belt, with brief summaries of the results of some cooperative feeding experiments.

Protein supplements and roughages for fattening two-year-old steers (*Iowa Sta. Rpt. 1923, pp. 22, 23*).—The comparative feeding values of 1.5 or 3 lbs. daily per steer of linseed-oil meal and cottonseed meal and the addition of corn silage to a ration of shelled corn and red clover were investigated, using 10 lots of 2-year-old steers each. The lots receiving for 120 days corn, clover hay, and block salt, with and without corn silage, made average daily gains of 2.4 and 2.3 lbs. per steer, but the cost of gain was somewhat reduced by corn silage. The linseed-meal groups made better gains than the cottonseed-meal lots and sold for the highest price per pound, the one receiving 1.5 lbs. per steer proving to be the most profitable of any lot.

Alfalfa versus clover hay for fattening cattle (*Wisconsin Sta. Bul. 362 (1924), pp. 100, 101*).—In comparing the feeding value of alfalfa and clover hay for fattening cattle, two lots of 10 2-year-old Hereford steers were selected for a 120-day test. The rations were so balanced as to supply an equal amount of digestible nutrients, the one lot receiving 6 lbs. of red clover hay, 9.3 lbs. of ear corn, 27 lbs. of corn silage, and 1.4 lbs. of cottonseed meal. The other lot received 6 lbs. of alfalfa hay, 27 lbs. of corn silage, 10 lbs. of ear corn, and 0.8 lb. of cottonseed meal. The alfalfa-fed steers made average daily gains of 2.26 lbs. per head, while those fed clover gained only 1.88 lbs. per head. The finish of the alfalfa steers was also better.

Relative value of wholemilk, skimmilk, and skimmilk powder for growth of cattle, and the best grains to supplement each as indicated by the selections made by the various calves, T. M. Olson (*South Dakota Sta. Rpt. 1923, pp. 15, 16*).—Four calves were selected for this test. They were each given different grains and alfalfa hay in separate compartments of a self-feeder . The results of the experiment indicated that the calves ate too much of the high protein feeds for best development or economical growth.

Minerals for baby beeves (*Ohio Sta. Bul. 373 (1923), p. 56*).—Minerals added to a ration of alfalfa hay, corn silage, corn, and oil meal did not increase the gains made by baby beeves, but body measurements at the end of the 11 months' test indicated a greater body growth in the mineral fed groups.

Wintering beef cows (*Ohio Sta. Bul. 373 (1923), p. 57*).—A continuation of this experiment (E. S. R., 48, p. 664) again indicated the superiority of corn silage over corn stover or stover silage, even when sufficient grain was supplied to make up for the corn which had been removed from the stover.

Range cow supplemental feeding experiment (*New Mexico Sta. Rpt. 1923, pp. 45–47, fig. 1*).—In comparing supplemental feeds to pasture for range cows, 6 lots of 6 cows each received the following rations: Lot A ground corn, lot B cottonseed cake, lot C ground corn and cottonseed cake equal parts, lot D whole corn, lot E cotton seed, and lot F 2 parts cotton seed to 1 part of ground corn. Lots A, B, C, and D were fed equal amounts, while lot E received an average of 1.656 and lot F 1.898 times as much as the first 4 lots. The cows were kept near maintenance, and no conclusions as to the feeding values of the rations were drawn, but records of the first and last 10 cows going out to pasture were kept, with the following average for the percentages of the first 10 out in each lot: E 26.4, D 21.69, A 19.09, F 14.55, B 13.55, and C 4.85 per cent. The average percentages from each lot making up the last 10 out were E 7.42, D 9.48, A 9.8, F 22.18, B 20.75, and C 30.25 per cent.

Wintering the pregnant ewe (*Iowa Sta. Rpt. 1923, pp. 27, 28*).—A continuation of this experiment (E. S. R., 49, p. 773), in which the addition of potassium chlorid to the ration of ewes was studied, showed that the lot receiving ¼ oz. per ewe daily made average daily gains of 0.362 lb. as compared with 0.27 lb. by the check lot. The salt consumption of the lots receiving ½ and 1 oz. of KCl was much reduced, but these lots apparently produced the strongest lambs.

Soy bean hay and seed in rations for sheep and lambs (*Ohio Sta. Bul. 373 (1923), p. 58*).—Soy bean hay has been found practically equal to alfalfa hay in rations containing corn, linseed meal, and corn silage for Merino ewes. Slightly more of the soy bean hay was refused, however, due to the coarser stems.

The results of another trial indicated that ground soy beans may replace linseed meal as a protein supplement to corn, alfalfa hay, and corn silage for fattening lambs. Coarsely ground soy beans were better than whole soy beans.

[Swine feeding experiments at the Ohio Station] (*Ohio Sta. Bul. 373 (1923), pp. 60–62*).—Feeding experiments with swine include the following:

Minerals in the ration for swine.—The rate of gain of pigs on rape pasture receiving a ration of corn, ground soy beans, and salt was increased from 1.13 to 1.21 lbs. per day by the addition of finely ground limestone to the ration.

In two other experiments a mixture of equal parts of salt, limestone, and bone meal proved more efficient than other mixtures in which one or more of these ingredients were omitted from the ration. The use of the minerals also developed stronger pasterns.

Alfalfa and limestone with corn and tankage for swine.—The addition of 3 per cent alfalfa or 1.5 per cent of limestone to the standard corn and tankage ration for fattening hogs increased the rate of gain.

Hogging down corn and soy beans.—In continuing the hogging down tests noted (E. S. R. 49, p. 372), pigs hogging down corn and late maturing soy beans gained more rapidly than those hogging down corn and early maturing soy beans.

In another experiment, pigs hogging down corn containing different supplementary crops and receiving tankage made average daily gains as follows: Soy beans and rape 1.8 lbs., soy beans 1.5, corn alone 1.73, rape 1.58, and an early variety of corn only 1.4 lbs. Harvested new corn produced gains of 1.98 lbs. Other lots receiving no tankage but with soy beans and rape, respectively, in the corn made gains of 1.02 and 1.15 lbs.

[Swine feeding experiments at the Wisconsin Station] (*Wisconsin Sta. Bul. 362 (1924), pp. 88, 89, 101–105*).—Several experiments dealing with swine feeding have been reported.

Prevention of rickets in swine.—Experiments by E. B. Hart and H. Steenbock have indicated that floats, steamed bone meal, and calcium carbonate are equally good as sources of calcium to prevent rickets provided the antirachitic vitamin is present. Twenty cc. of cod liver oil per week has been found sufficient to protect against the development of rickets, but there is some difference in the potency of cod liver oils. In these experiments the inorganic phosphorus content of the blood has been found unsatisfactory as an index of rickets; individuals having over 5 mg. per 100 cc. of serum have been in a state of total collapse.

Increasing efficiency of swine rations.—In experiments to compare different rations for fattening swine on pasture, F. B. Morrison and J. M. Fargo found in three trials that pigs gained an average of 1.17 lbs. per head daily when receiving corn and linseed meal and required 420 lbs. of concentrates per 100 lbs. of gain. When tankage was fed as the supplement to corn, the average daily gains were 1.34 lbs. and only 393 lbs. of feed were required per 100 lbs. of gain. In five further experiments, pigs receiving a mixture of half tankage and half linseed meal as a supplement to corn and pasture gained an average of 1.43 lbs. per head daily, requiring 370 lbs. of feed per 100 lbs. of gain. For winter feeding in dry lot the mixture of linseed meal and tankage was not so efficient. In eight experiments a mixture of 50 lbs. of tankage, 25 lbs. of linseed meal, and 25 lbs. of chopped alfalfa as a supplement to yellow corn produced gains of 1.16 lbs. per day, while those receiving corn and tankage gained only 0.97 lb. and required 20 lbs. more feed per 100 lbs. of gain. A mixture of corn germ meal and tankage was less efficient as a supplement to corn for pigs on pasture than linseed meal and tankage.

Rations for brood sows.—In experiments by Morrison, G. Bohstedt, and Fargo rations of ear corn, alfalfa hay, and 0.3 lb. tankage per head daily were compared with a concentrated mixture of 35 parts of ground corn, 30 parts of ground oats, 30 parts of wheat middlings, and 5 parts of tankage for gilts. The gilts required 5.5 lbs. of the mixture daily to make gains of about 0.9 lb., while slightly larger gains were made on a ration of 4.5 lbs. shelled corn, 0.3 lb. of tankage, and 0.4 lb. of alfalfa hay. The farrowing results were also a little better on the latter ration. Gilts fed 0.33 lb. of tankage per head daily in addition to alfalfa hay and ear corn made larger gains during four winters than gilts receiving alfalfa hay and corn only, and the pigs were heavier and more vigorous. The alfalfa and corn ration was, however, quite satisfactory. In four winters' experiments no advantage was shown by the addition of sugar mangels or yellow carrots to rations of corn, tankage, and alfalfa or clover hay and a grain mixture for young or old sows.

Do brood sows fed good rations need mineral supplements?—In two years' experiments by Morrison and Fargo to study the value of adding minerals to the rations of gilts, three lots of 12 pigs each the first year and 10 the second year were selected and fed on well balanced mixtures of corn, oats, wheat middlings, linseed meal, tankage, and salt, with alfalfa pasture the first year and blue grass pasture the second year. Lots 2 and 3 received in addition 2 lbs. of steamed bone meal and ground limestone, respectively, per 100 lbs. of the grain mixture. No advantage in gains or economy of growth was shown during the winter or summer from adding the minerals, nor were the pigs produced by the lots receiving the minerals any better.

[Minerals for swine] (*Iowa Sta. Rpt. 1923, pp. 23–27*).—Two experiments are reported dealing with the value of including minerals in the rations of swine fattened on pasture and in dry lot.

Feeding minerals to fattening pigs on blue grass.—In this experiment 12 lots of spring pigs were self-fed shelled corn and hand-fed 0.3 lb. (increased after 100 days to 0.5 lb.), of a mixture of corn oil cake meal, linseed oil meal, and meat meal tankage, 4:4:2, with access to blue grass pasture. Five different mineral mixtures were included in the supplemental feeds at the rate of 7 lbs. per 100 lbs. of feed. The time required to reach 225 lbs. in weight was determined. The two lots receiving no additional minerals gained 0.84 and 0.89 lb. per day, while the lots receiving minerals gained from 1.29 to 1.36 lbs. Apparently the minerals not only increased the rate of gain but reduced the amounts of feed required per unit of gain.

Feeding minerals to fattening pigs in dry lot.—This study has been continued similar to that of the previous year (E. S. R., 49, p. 774). Ten lots of 10 pigs each were fed on the same rations except that the amounts of minerals supplied were calculated on the basis of the content of common salt, 3 lbs. being supplied per 100 lbs. of supplemental feed. The mineral fed groups all made more rapid gains and required less feed per unit of gain than either of the check groups. The simple mixture of common salt, bone meal, and limestone, equal parts, gave good results, though the addition of wood ashes and sulphur proved of additional value. No particular advantage was evidenced by the addition of Glauber salts, Epsom salts, and copperas to a fairly complete mineral mixture.

[Poultry investigations at the Iowa Station] (*Iowa Sta. Rpt. 1923, pp. 31–35, 40, 44, 45*).—The investigations with poultry included both feeding and breeding experiments, some of which are continued from the previous year (E. S. R., 49, p. 777).

Molt of hens and its relation to egg production.—A detailed study of the relation of the time and manner of molting to egg production was made. Most high producers were found to begin their molt during October, November, or December and complete the molt in less time than was found to be the case with low producers. Many of the high producers do not molt all the flight feathers, while low producers may molt part of the flight feathers twice a year.

Rations for starting chicks.—A more detailed report of the studies of the value of adding vitamin-rich feeds to the rations of baby chicks is noted on page 473.

Comparison of dried buttermilk, fresh buttermilk, tankage, and meat scraps for laying hens.—Six lots of hens receiving a basal scratch grain, 2 parts whole corn and 1 part oats, and a mash of equal parts of ground corn, ground oats, and flour middlings laid average numbers of eggs per year when receiving the following supplements to the mash: 20 per cent tankage 117.5, 21.8 per cent meat scrap 97.3, 15 per cent dried buttermilk 119.8, 20 per cent meat scrap 98.4, no supplement 43.2, and fresh buttermilk to drink instead of water 145.1 eggs. Buttermilk produced the most eggs at the lowest cost when hens were forced to consume large amounts of it by not having other drink, but the tankage is often more easily obtained.

Values of dried, semisolid, and fresh buttermilk in crate-fattening poultry.—Dilutions of semisolid buttermilk of 1:4 and 1:5 produced more rapid and economical gains in crate-fattened poultry than dilutions of 1:3, 1:6, 1:7, or 1:8.

Results of poultry-breeding experiments.—A study of the best portion of the year to trapnest to get an estimate of the annual production of pullets showed that with Rhode Island Reds the trapnest records of July and August gave the highest correlation with annual production, 0.66. Though the correlation was not as high, July and August was also the best time to select White Leghorns by trapnest records. Correlations between hatchability of eggs and annual production were very low, −0.10 for Rhode Island Reds and −0.17 for White Leghorns, indicating that the best layers do not produce the best hatching eggs.

[Poultry experiments at the New Mexico Station] (*New Mexico Sta. Rpt. 1923, pp. 41, 42, fig. 1*).—The following experiments in incubating and brooding chicks are reported:

Incubation.—The necessity of having plenty of moisture in the incubator for successful hatches under New Mexico conditions has been experimentally demonstrated. The eggs from breeders having access to semisolid buttermilk hatched better than those from breeders receiving other animal proteins. Electric lights were found injurious to the best hatching results.

[*Feeding chicks*].—Corn bread made with sterile eggs from the incubator was satisfactorily used to carry chicks until they were able to consume coarser feeds.

[Experiments with poultry at the Ohio Station] (*Ohio Sta. Bul. 373 (1923), pp. 62–64*).—The annual report of the investigations with poultry include the results of the following experiments, some of which have been continued from earlier studies (E. S. R., 48, p. 667).

Vegetable proteins and mineral supplements for laying hens.—Pullets receiving a basal ration having the mash supplemented by 20 per cent of meat scrap laid an average of 117 eggs per bird in 12 months, whereas other lots receiving like amounts of peanut meal plus two different mineral supplements laid 96 and 105 eggs. The indications were that acid phosphate and ground limestone were equally as efficient sources of minerals as steamed bone meal and calcium carbonate.

In another experiment, pullets receiving a cottonseed meal supplement to a basal mash produced an average of 45 eggs, but with a mineral mixture added to this an average of 101 eggs was produced per bird.

Amount of meat scraps in the mash for laying hens.—Lots of White Leghorns and Barred Rocks received rations in which 20 per cent of meat scrap and 10 per cent of meat scrap with and without 2 per cent of mineral mixture were added to the mash. In both cases, with the mashes containing 10 per cent of meat scrap, the number of eggs produced was reduced, but when the minerals were added the numbers of eggs laid were practically equal to those produced with the 20 per cent meat-scrap rations.

Sources of lime for egg-shell formation.—Four lots of 30 Barred Rocks furnished with different types of grit produced the following average numbers of eggs per year: Oyster shells and mica grit, 134; oyster shells and limestone grit, 132; limestone grit, 112; and mica grit, 100 eggs.

[Feeding experiments with poultry at the Wisconsin Station] (*Wisconsin Sta. Bul. 362* (*1924*), *pp. 90–96, 97, figs. 6*).—The feeding experiments conducted with poultry include the following:

Direct sunlight is factor in animal growth.—A continuation of these experiments by Steenbock, Hart, Lepkovsky, and Halpin (E. S. R., 50, p. 780) has demonstrated the importance of sunlight in the growth and development of chicks. Two lots of 10 chicks each were confined in a basement while two other lots were on board floors out of doors. One each of the inside and outside lots received rations of 97 parts of white corn, 2 parts of ground limestone, and 1 part of salt, with free access to skim milk. The other two lots received the same ration, except that yellow corn replaced the white corn. All lots grew normally for 2 weeks, after which the lot confined in the basement and receiving white corn ceased to grow and soon died. At the end of 5 weeks all but 2 of the chicks in the other basement-fed lot had died. The two outside lots made good growth, the white-corn lot reaching 600 gm., after which they developed eye trouble and an unsteady gait. The outside lot receiving yellow corn produced eggs at four months of age. The experiment shows that sunlight tends to remedy a deficiency of the antirachitic vitamin in the ration.

Leg weakness in chickens.—Experiments conducted by Halpin and Hart have indicated that leg weakness and rickets are kindred diseases, and that cod liver oil, eggs, milk, and green feed are active agents in preventing the trouble.

Growth of chicks affected by ration of hens.—The hatchability of the eggs of hens receiving a ration of white corn and casein was very poor and most of the chicks died within 48 hours. Chicks on a ration known to produce leg weakness did not show such symptoms any quicker when hatched from eggs laid by hens receiving a white corn-pork liver ration than those hatched from eggs laid by hens receiving yellow corn and pork liver.

Color of egg yolk affected by feed.—The feeding of yellow corn and green feeds has been found to produce yellow yolks in the eggs, while white corn tends to produce white yolks. Yellow carrots had a slight tendency to cause yellow yolks.

Feeding thyroid affects plumage of fowls.—Roosters having their feathers partially pulled out and receiving dried thyroid powders in regular doses were found by L. J. Cole and D. H. Reid to develop feathers of the female type in place of those which had been pulled.

The function of grit in the gizzard of the fowl, B. F. Kaupp (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 6, pp. 413–416, pl. 1*).—Previously noted (E. S. R., 50, p. 274).

Brooding and feeding chicks, B. Alder (*Utah Sta. Circ. 50* (*1924*), *pp. 3–16, figs. 2*).—The management and construction of brooders and rations for baby chicks are discussed, as well as other miscellaneous phases of chick raising.

The occurrence of lactase in the alimentary tract of the chicken, T. S. Hamilton and H. H. Mitchell (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 8, pp. 605–608*).—The crop, proventriculus, pancreas, and intestine of from 3 to 6 chickens in each of three tests were ground together in a mortar, water was added with a little toluene for preservative, and the filtrates from these were tested for the presence of lactase by adding 25 cc. of boiled and unboiled samples of the extract to 50 cc. of a 4 per cent lactose solution and the material tested for monosaccharids by Barfoed's test after incubating at 36 to 38° C. for from 2 to 6 days. All samples to which boiled extracts were added showed negative results, whereas the unboiled extracts of the crop all indicated the presence of lactase and two extracts from the intestine and one from the proventriculus were questionable. All other extracts were negative as to their content of lactase. Unboiled extracts of the small intestines of five rats were also found to hydrolyze lactose with the formation of monosaccharids.

The utilization of lactose by the chicken, T. S. Hamilton and L. E. Card (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 8, pp. 597–604*).—The results of seven experiments at the Illinois Experiment Station to determine the ability of hens to utilize lactose are reported. The hens were furnished with a daily basal ration of 60 gm. of oats and cracked corn and 30 gm. of moistened mash, with the addition of 2, 6, 18, and 24 gm. of lactose to the mash in four of the experiments. The feces were extracted with water, and the extract was quantitatively tested for reducing sugars by the Munson-Walker-Bertrand method and by the Benedict method, and qualitatively tested for lactosazone and glucosazone crystals by the phenylhydrazin test. The latter test showed that no osazones were present in the excreta when 2 and 6 gm. of lactose were fed, but with 18 and 24 gm. both lactosazones and glucosazones were present, and glucosazones were present when the basal ration was fed in the periods following the heavy lactose feeding. The quantitative tests also indicated a practically complete utilization of the lactose in the smaller amounts and in nearly all cases over 75 per cent utilization when the large amounts of lactose were fed.

Over 2 gm. per day of the lactose caused diarrhea, which may have tended to interfere with the results. A test was made to determine if diarrhea caused an increase in the excretions of reducing sugars, and the results were negative. These experiments thus demonstrated the ability of hens to utilize lactose, but they would not voluntarily consume more than 8 gm. of lactose per day mixed with the ration, the consumption of the larger amounts being through forced feeding.

The effect of certain vitamin-carrying additions to a normal ration for baby chicks, C. W. Knox and A. R. Lamb (*Poultry Sci., 3* (*1924*), *No. 3, pp. 101–108*).—The results of three experiments in raising baby chicks carried on at the Iowa Experiment Station are reported. Three, six, and nine lots of chicks each were used in the different experiments. The basal rations fed to all lots consisted of a scratch grain of corn, wheat, and oats and a mash of bran, corn meal, oat flour, tankage, alfalfa meal, bone meal, and a mineral mixture. Suitable sources of vitamins A, B, and C were added to the mash fed to the different lots, and the weights of the chicks at eight weeks of age were determined.

The best growth was obtained when the basal ration was supplemented with 5 per cent of yeast, but the lots receiving buttermilk were a close second. Chicks receiving 2 or 3 per cent of supplements of cod liver oil made poorer gains than the controls. Cooking the mash also reduced the growth. When tomato juice was added to the basal ration the gains were not any better, although adding tomato juice to the cooked-mash ration slightly increased the gains. It is suggested that the favorable results with yeast may have been due to supplementing proteins or other factors as well as to the vitamin B content.

DAIRY FARMING—DAIRYING.

[Experiments with dairy cattle at the Iowa Station] (*Iowa Sta. Rpt. 1923, pp. 30, 31*).—Included in the investigations was a feeding test in which corn silage and roots produced better and more economical gains in calves than when no succulent feed was supplied. The roots proved slightly more desirable than the silage.

The average length of 369 gestation periods of dairy cattle in the station herd was 280 days for both male and female calves.

[Feeding for milk production], T. M. Olson (*South Dakota Sta. Rpt. 1923, pp. 18–21*).—The following experiments deal with the effects of feed on milk production:

Effect of silage on vitamin C potency of milk.—Scurvy developed in 7 of 8 guinea pigs fed on milk from a herd receiving no silage in the ration, whereas only 3 of another lot of guinea pigs similarly fed on the milk from a herd receiving silage developed scurvy. It is thus concluded that the vitamin C content of silage is probably an important factor in producing such good results with the milk from the silage-fed herd.

Feed as a factor in economical milk production.—The results of feeding tests with cows of different ages and producing ability conducted over a two-year period indicate that the purchase of bran and oil meal is not warranted for medium-producing cows when alfalfa hay and corn silage are available. Low-producing cows produce milk most economically without grain. It is, however, more profitable to furnish high-producing animals with protein-rich feeds.

Factors affecting milk secretion.—Analyses of the fat content of different portions of the milk drawn from cows' udders indicated that the fat either rises to the top of the milk cistern or clings to the walls of the ducts, as the foremilk from a nonmanipulated udder is usually found to be low in fat.

Effect of high-protein feeds on the per cent of fat in cow's milk.—In one test the fat percentage of a cow was increased 15 per cent over a period of 10 days by the addition of soy beans to the ration. No increase was produced by other high-protein feeds in experiments with other animals.

Soybean hay for milk production (*Wisconsin Sta. Bul. 362 (1924), pp. 99, 100*).—In comparing the feeding value of soy bean and alfalfa hay for milk production by F. B. Morrison, E. S. Savage, and R. S. Hulce, two lots of 6 cows were fed by the double reversal method on rations of soy beans or alfalfa hay, corn silage, and a grain mixture. Equal amounts of feed were given each lot, but 17.8 per cent of the soy beans were not consumed. The milk production on the soy bean ration averaged 1.1 lbs. per cow and the fat 0.02 lb. per cow less than on the alfalfa ration, and the weight of the cows was not as well maintained.

Increasing dairy production by heavier feeding (*Ohio Sta. Bul. 373* (*1923*), *pp. 53, 54*).—Twenty-three cows fed on what is termed ordinary rations produced an average of 8,199 lbs. of milk and 336 lbs. of fat per lactation, but when the rations of these cows were increased about 50 per cent they produced an average of 13,546 lbs. of milk and 568 lbs. of fat per lactation. It thus required very much less feed per pound of fat when the increased rations were fed.

The relation between age and fat production in dairy cows, A. C. RAGSDALE, C. W. TURNER, and S. BRODY (*Jour. Dairy Sci.*, 7 (*1924*), *No. 2, pp. 189–196, figs. 3*).—This is essentially the same material as was previously noted (E. S. R., 50, p. 578), with slight additions to the data.

[Mineral metabolism of dairy cows] (*Wisconsin Sta. Bul. 362* (*1924*), *pp. 85–88, fig. 1*).—Several experiments dealing with the mineral metabolism of dairy cows have been continued.

Effect of mineral supplement to good and poor roughages.—In studying the effect of a mineral supplement during the dry period to good and poor roughages, one group of 4 cows received a ration of timothy hay, silage, and a grain mixture, with ½ lb. of bone meal per animal daily during the dry period (60 days). A second and third group received alfalfa hay in place of the timothy hay and in the third group the bone meal was replaced by sodium acid phosphate. The milk production of all three groups was well maintained during the year, but the timothy hay lot was slower in breeding and the cows dried off more quickly after they had been bred.

Effect of curing methods on availability of calcium.—Experiments by C. A. Hoppert in studying the effect of curing alfalfa and clover hay in different ways indicated that hays dried in the sun but not exposed to rain or dampness retained the antirachitic factor in greater abundance than those which were exposed to all weather conditions. Hays cured in the ordinary manner were as high in calcium content as any others, but the calcium was almost completely unavailable. A study of the distribution of the antirachitic vitamin has indicated that it is not usually present in carrots or hay. It is suggested that animals may need sunlight to aid calcium and phosphorus assimilation. These tests were carried on with dry, milking, and growing goats.

Effect of roughages grown on acid soils on reproduction.—Cows fed on hay and straws grown on acid soils which were low in lime have not been able to produce normal healthy calves with one exception, which has been thought to be due to the method of curing the hay.

[Legumes for dairy heifers] (*Ohio Sta. Bul. 373* (*1923*), *pp. 54, 55*).—In continuing these studies (E. S. R., 49, p. 375) four heifer calves receiving a ration of corn meal and alfalfa hay made average daily gains of 1.34 lbs. as compared with 1.36 lbs, by a similar group receiving the same amount of corn and soy-bean hay.

In another experiment yearling heifers receiving a ration of corn meal and clover hay made average daily gains of 1.17 lbs. as compared with 1.45 lbs. made by a similar lot on nearly like amounts of corn meal and alfalfa hay. Regular measurements of height at withers and heart girth were made.

Raising dairy calves economically (*Wisconsin Sta. Bul. 362* (*1924*), *pp. 96, 98, 99*).—During three seasons experiments have been carried on by F. B. Morrison, R. S. Hulce, and G. C. Humphrey in comparing different rations for rearing calves. A control lot of 4 calves has been fed each year on a ration of not over 14 lbs, of skim milk per head daily, clover hay, and a mixture of corn, oats, wheat bran, and linseed meal, with water and salt. The average gains made by the controls were 1.76 lbs. per head daily. Lots of calves similarly fed except that the skim milk was limited to 10 lbs. made average daily gains of 1.52 lbs. Other lots fed on whole milk not to exceed a total of 400 lbs. per calf, with a mixture of equal parts of the grains given to the control lot, gained an average of 1.43 lbs. per day. No milk was given these calves after the age of from 7 to 9 weeks. Lots of calves fed on pasteurized whey with appropriate supplements made gains of 1.49 lbs. daily. In one trial a lot of calves was fed the same as the controls except that no water was given. This lot made average daily gains of 1.32 lbs. as compared with 1.86 lbs. made by their controls, which were watered twice daily.

Milk goat project (*New Mexico Sta. Rpt. 1923, pp. 43, 44*).—This project (E. S. R., 47, p. 480) has been continued, and six half-blood Toggenburg does show increases of 73.2 per cent over the production of their dams and two three-fourths blood Toggenburgs show increases of 14.14 per cent over their half-blood dams. There has, however, been a corresponding reduction in the butterfat test.

Variations in amount of milk and per cent of fat in the milk from different quarters of the cow's udder, J. B. Fitch and L. Copeland (*Jour. Dairy Sci., 7 (1924), No. 2, pp. 169–173, figs. 5*).—To study the variations in the amount of milk and percentages of butterfat produced by the different quarters of cows' udders, at the Kansas Experiment Station each quarter of three Jerseys and two Holsteins were milked into separate pails for four consecutive milkings, with a repetition of the experiment after two weeks. The amount of milk from each quarter was determined, as well as the butterfat percentage.

When considering all cows, no one quarter excelled the others in quantity of milk or fat percentage, but certain quarters of individual cows were found to be uniformly higher or lower than others. The authors conclude that "while the fat test for the different quarters was more constant than the milk yields, there appeared to be a tendency for the quarters low in milk to be also low in percentage of butterfat." The detailed results are presented in the form of graphs and tables.

The color of cow's milk and its value, F. J. Doan (*Jour. Dairy Sci., 7 (1924), No. 2, pp. 147–153*).—In a test conducted at the Maryland Experiment Station from April 16 to November 12 of the color of the butterfat of two cows, it was found that the rations fed materially affected the color. When green feeds were furnished, or shortly afterwards, the intensity of color was much greater, and there was some evidence to indicate that changes of the kinds of green feed fed reduced the color. The tests of color were made by comparing melted centrifuged butterfat after filtering with the red and yellow colored glasses of a Lovibond tintometer. The color of the milk is deemed of no great importance except that it may act as an indicator of the vitamin A content.

Associative action as a cause of yellow color in yeast colonies, B. W. Hammer (*Jour. Dairy Sci., 7 (1924), No. 2, pp. 163–168*).—In experiments at the Iowa Experiment Station, a definite associative action between certain yeasts common to dairy products and cultures of *Aspergillus niger* has been found to produce a yellow color when both are growing on the same whey agar slants. This color was not produced when either organism was dead, or when other species of Aspergillus were employed with the yeast. Such an associative action is suggested as a possible cause of the yellow color produced on such products as cheese.

[Experiments with dairy products at the Wisconsin Station] (*Wisconsin Sta. Bul. 362 (1924), pp. 79–81*).—The results of experiments with dairy products are reported, many of which are continuations of those previously noted (E. S. R., 49, p. 679).

Stinker Swiss cheese.—Further studies by E. G. Hastings and W. C. Frazier of the cause of this condition in cheese have shown that the butyric acid-forming bacteria previously isolated were not entirely responsible in pure culture, but that another organism which has been isolated has been found to produce the condition when in combination with the butryic acid organism, or with the gas-forming bacteria from Nissler cheese.

Rôle of bacteria in curdling evaporated milk.—Small amounts of a milk culture of the organism causing sweet curdling of milk were found by Frazier to inhibit heat coagulation, but the addition of larger amounts of this organism to the milk aided heat coagulation. An enzym resembling rennet was isolated from cultures. The enzym alone was found to have comparatively little influence on heat coagulation, the acidity being important. Heating at 140° F. for 20 minutes weakened the enzym produced by these organisms, and at 150° destroyed it.

Heat coagulation of milk.—Two experiments were conducted by H. H. Sommer and W. L. Lerch to study the effect of the calcium content of the feed of cows on the heat coagulability of the milk. In the first experiment 4 cows were fed a ration low in calcium, to which was later added 100 and finally 200 gm. per day of precipitated calcium carbonate. The milk was tested for titratable acidity, H-ion concentration, alcohol and heat coagulation. and content of calcium, phosphorus, and citric acid. No consistent changes in the properties of the milk due to the feed were observed.

Like results were obtained when the experiment was repeated and the cows received 100 cc. portions of cod liver oil daily as a source of vitamin D. In another experiment 3 cows were given green feeds to which bone meal was later added. The milk coagulated more rapidly in the rennet and alcohol tests after the addition of bone meal, and a slight change was produced in the heat coagulation test, though no changes in the calcium content or in the acidity were detected. High preheating temperatures have been found to cause the milk to coagulate less readily, high preheating temperatures having been found to precipitate more calcium and albumin than low preheating temperatures.

VETERINARY MEDICINE.

Handbook of biological methods.——XIII, Methods of immunity investigation and of experimental therapy. I, Experimental therapy, biological therapy, and diagnosis of animal diseases, edited by E. Abderhalden (*Handbuch der Biologischen Arbeitsmethoden. Abt. XIII, Methoden der Immunitätsforschung und der Experimentellen Therapie. Teil I, Experimentelle Therapie, Biologische Therapie und Diagnostik der Tierseuchen. Berlin: Urban & Schwarzenberg, 1920, pt. 1, No. 1, pp. 1–175, figs. 12; 1921, pt. 1, No. 2, pp. 177–360; 1922, pt. 1, No. 3, pp. 361–626+XVIII, pl. 1, figs. 6*).—The first section of this handbook, by W. Schürmann, deals with general methods for active, passive, and combined active and passive immunization and with the technique of the preparation of antisera and their value and application.

In sections 2 and 3 on special methods of immunization against various diseases, the subjects and authors are as follow: Glanders, by A. Marxer; Rabies, by A. Aujeszky; Bovine Pleuropneumonia and Bradsot, by C. Giese; Rinderpest and Bovine Infectious Abortion, by H. Zeller; Blackleg and Tetanus, by F. von Werdt; Hog Cholera and Swine Septicemia, by J. Köves; Piroplasmosis, by C. von Schilling; Foot-and-Mouth Disease, Hemorrhagic Septicemia, Strangles, and Swine Erysipelas, by T. Kitt; Chicken Pox, by A. Gminder; Anthrax, by G. Sobernheim; Tuberculosis and the Technique of the Tuberculin

Reaction in Animals, by A. Eber; and Biological Methods as an Aid to Diagnosis in Veterinary Medicine, by C. Titze.

Local resistance and local immunity to bacteria, F. P. Gay (*Physiol. Rev., 4 (1924), No. 2, pp. 191–214*).—In this review the author discusses the evidence for the existence of a local form of immunity, attempts at immunization by mouth and through the skin, and the mechanism by which local resistance to bacteria is secured. An extensive bibliography is appended.

Studies in vaccinal immunity toward disease of the bovine placenta due to Bacillus abortus (infectious abortion), T. Smith and R. B. Little (*Rockefeller Inst. Med. Research Monog. No. 19 (1923), pp. 124, fig. 1*).—This is the complete report of an extensive investigation conducted by the department of animal pathology of the Rockefeller Institute of Medical Research, Princeton, N. J. Some of the special phases of the investigation which are touched upon briefly have been noted from separate reports (E. S. R., 41, pp. 85, 779, 780; 42, p. 778; 45, p. 180).

The investigation proper consisted of two experiments. In the first a thorough study was made of the effect of living cultures of *B. abortus* on a large number of heifers, the work being carried through the second pregnancy. At the same time groups of nonvaccinated control heifers were studied through the same period. The second experiment consisted of a repetition of the work of the first with groups of heifers more homogeneous with reference to external conditions and an extension of the experiment to a study of the effect of repeated injections of heated cultures of the organism.

Two strains of *B. abortus*, one of which had been under cultivation only 32 days and the other 574 days, were used as vaccines, no appreciable difference being noted between the two. The dose was from 2.5 to 5 cc. of a suspension equivalent in density to a 24-hour bouillon culture of typhoid bacilli, 1 cc. containing roughly one billion bacilli. In most cases the vaccine was injected under the skin of the neck. From time to time samples of the blood of the infected animals were tested for agglutinins by the method previously described (E. S. R., 41, p. 780). In some cases the colostrum and milk were tested for agglutinins. Careful examinations were made of the placentas, aborted fetuses, etc. The data reported in both experiments included detailed histories of the individual animals.

In the first experiment, comprising 134 control and 53 vaccinated heifers, the vaccinated animals had only a slight advantage over the nonvaccinated, the abortion rate being 16.7 and 11 per cent, respectively, for first and second pregnancies as compared with 25.1 and 19.2 per cent for the control groups. The value of the vaccination was more apparent in the second than in the first pregnancy.

In the second experiment, comprising 35 heifers treated with heated cultures and 10 with living cultures, the combined abortion rate for the first pregnancy was 14.7 per cent as compared with 41.6 per cent for 38 controls. There were no abortions among the 10 treated with living cultures.

In discussing the use of heated vaccines it is concluded that "the precise place of killed cultures in the suppression of this disease is open to debate. The injection of such cultures brings about an agglutinin reaction whose height depends on the number of doses and their size. It interferes, therefore, with the agglutination test as an indication of actual disease unless accurate and extensive quantitative studies are made to provide standards for the reaction under various conditions. Provided with such standards, the one administering vaccines might be able at certain times to distinguish agglutination reactions due to dead cultures from those due to actual infection. Barring the disadvantages resulting from the ambiguous agglutination test, the use of killed cultures as vaccine might be of use in herds still free from infection, but threatened with it through additions to the herd from without, as well as through various other still undefined avenues such as feed, bedding, wild animals on pasture, etc. This method would be far more costly than the single injection of living virus. When the disease prevails in a herd there does not appear to be any advantage in killed over living vaccine, provided the latter is so chosen as to be not actually provocative of disease."

Among the general conclusions drawn are the following:

"Vaccination with living cultures should be applied only in herds in which abortion in the first pregnancy is frequent and in which cows freshly introduced abort the first or second calf. Vaccination with small doses of living bacilli (one agar slant or less) practiced two or three months before conception is not a dangerous procedure.

"Heifers or cows injected when pregnant may, but do not necessarily abort. A small proportion of virgin heifers have a high blood titer and they may be regarded as infected, the virus being localized in the udder. When possible, segregation of heifers up to the first calving and vaccination before the second breeding is recommended, provided the agglutination test to eliminate infected heifers is employed. . . .

"Vaccination will probably have different effects in different herds. The deciding factors are (1) the relative susceptibility of the animals, which in turn is governed by the length of the period during which the disease has prevailed and consequently the extent to which it has eliminated chronic aborters, and (2) the concentration of the infectious material in the environment of the herd.

"The use of vaccines does not in itself tend to eliminate the infectious agent from any herd, although it may greatly reduce the infectious material quantitatively by reducing the number of cases of placental disease.

"Animals treated with living virus should not be herded with the unvaccinated unless the latter have passed through the disease or have a high agglutinin titer."

The abortin test in guinea pigs in relation to the differentiation of infected and immune animals (*Ontario Vet. Col. Rpt. 1923, pp. 54–56*).—The conclusions previously drawn by Stafseth concerning the value of the abortin test for detecting abortion infection in guinea pigs (E. S. R., 44, p. 878) have been confirmed by experiments conducted in a like manner.

Thirty guinea pigs were divided into three lots and kept in separate places to avoid the danger of infection. Ten were given injections of 1 cc. of a fairly heavy suspension of living cultures of *Bacterium abortus*, 10 received three doses of heat-killed suspensions over a period of 10 weeks, and 10 were left as controls. Eighteen days after the last injection all of the animals were bled from the ear into sodium citrate solution for agglutination tests, and at the same time were injected with abortin consisting of a heat-killed suspension of *B. abortus* in salt solution. All of the animals in the first group gave complete agglutination and distinct abortin reactions, all of the second group complete agglutination but negative abortin reactions, and all of the uninoculated controls negative results in both tests.

A comparative bacteriological study of bovine abortion and undulant fever, II, Z. Khaled (*Jour. Hyg.* [*London*], *22* (*1924*), *No. 3, pp. 335–342*).—"Certain cross-immunization experiments (on monkeys) with *Bacterium abortus* and *B. melitensis* carried out in 1921 [E. S. R., 46, p. 775] were repeated with the same effective result. It was found that goats vaccinated intravenously with *B. abortus* in massive doses are protected from subsequent infection with a virulent *B. melitensis* strain, and fail to pass that organism in the milk. The record of the effect of *B. abortus* vaccine in treating three cases of undulant fever is given."

Foot-and-mouth disease, H. J. Frederick (*Utah Sta. Circ. 51 (1924), pp. 4*).—This is a practical summary of information.

Foot-and-mouth disease [trans. title], A. Daille (*Rev. Vét. [Toulouse], 76 (1924), Nos. 3, pp. 137–149; 4, pp. 201–215*).—This is a general review of the subject, with a bibliography of five pages (pp. 211–215).

[Report of the South Dakota Station] department of veterinary, C. C. Lipp (*South Dakota Sta. Rpt. 1923, pp. 35, 36*).—This consists of a brief report of work conducted with hemorrhagic septicemia, which is widely prevalent among cattle, sheep, and fowls in many parts of South Dakota.

Attempts at the diagnosis of Micrococcus melitensis infection in the goat by inoculation with melitin.—Irregular reactions [trans. title], E. Burnet (*Arch. Inst. Pasteur Tunis, 13 (1924), No. 1, pp. 1–6*).—The application of the melitin test (inoculation in the ear of 1 cc. of filtrate) and the agglutination test to 23 herds of goats gave the following results:

Of the 645 goats, 85 or 13 per cent reacted to melitin and 37 or 5.7 per cent gave a positive serum reaction. The two reactions were positive in 2.5 per cent, the melitin test alone in 9.5, and the agglutination test alone in 3.3 per cent. The discrepancy in results is so great that the conclusion is drawn that the melitin reaction is not suitable for practical use in the diagnosis of Malta fever in goats.

Prophylactic rabies immunization by the one-injection method, A. Eichhorn and B. M. Lyon (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 6, pp. 690–696*).—Further data are given confirming a previous report of the value of prophylactic rabies immunization of dogs by the method of Umeno and Doi (E. S. R. 47, p. 385).

Quantitative peculiarities of mixtures of the virus and immune serum of Rocky Mountain spotted fever, C. L. Connor (*Jour. Med. Research, 44 (1924), No. 3, pp. 317–328*).—Attention is called to a paradoxical reaction sometimes occurring when titrating the protective property of an immune serum against the virus of Rocky Mountain spotted fever, namely, that protection is secured by a small amount of serum and not by a larger amount, although a still larger amount again affords protection. A systematic study of this phenomenon has brought out the following facts:

"It occurs regularly only with serum collected within ten days after reinoculation of the animal with virus when antibody is less in proportion in the blood than after the twelfth day. It occurs with serum collected two days after the first inoculation with virus when no antibody can be demonstrated in the serum. It occurred with normal rabbit serum." These data are thought to point to the belief that the phenomenon does not depend upon antibody alone for its reproduction, i. e., it is nonspecific.

Cutaneous hypersensitiveness to tuberculin in guinea pigs, L. B. Lange (*Jour. Med. Research, 44 (1924), No. 3, pp. 293–304*).—Three series of experiments conducted on guinea pigs are reported, the object of which was to throw light on the relation of the tuberculous focus to the causation of skin hypersensitiveness to tuberculin. The experiments consisted in injecting normal and tuberculous guinea pigs with filtered extracts of tuberculous foci and of sterile foci obtained by the injection of a suspension of kieselguhr, and subsequently testing the injected and control animals intracutaneously with a water extract of tubercle bacilli.

The tuberculous guinea pigs treated intraperitoneally with filtered extracts of tuberculous foci gave a more violent reaction than the controls when tested intracutaneously with a water extract of tubercle bacilli.

Normal guinea pigs treated intraperitoneally with the extracts of tuberculous foci or of sterile inflammatory foci developed skin hypersensitiveness of the tuberculin reaction type to the water extract of tubercle bacilli. The skin reactions to tuberculin of infected animals and of those sensitized with filtrates of focal tissue extract were in some cases indistinguishable, although the latter never showed hemorrhage or necrosis. Guinea pigs with sterile inflammatory foci showed no cutaneous tuberculin reaction.

The standardisation of tuberculin, A. J. Eagleton and E. M. Baxter (*Brit. Jour. Expt. Path., 4 (1923), No. 6, pp. 289–304*).—The method previously described (E. S. R. 45, p. 582) has been modified by omitting the Pirquet test (except in the testing of tuberculin to be used for the Pirquet and other similar tests), and using first the intracutaneous test, followed by the subcutaneous test as a check. The technique of the modified method is described in detail, with suggestions based upon the authors' experience in its use and with illustrative data.

Tuberculosis of the domestic animals, E. G. Hastings (*Wis. Agr. Col. Ext. Circ. 165 (1924), pp. 26, figs. 7*).—The present status of knowledge of tuberculosis of domestic animals is presented in a popular way in the form of questions and answers.

[Livestock diseases in Wisconsin] (*Wisconsin Sta. Bul. 362 (1924), pp. 105–109*).—A brief report is made by F. B. Hadley and B. A. Beach of progress during the year in the study of infectious abortion of swine, an account of which is noted on page 482. In an attempt to ascertain the relative prevalence of hernias in swine, it was found that 8.5 per cent of 59 pigs raised from sows sired by a boar afflicted with hernia developed the affection, while 3.77 per cent of 1,008 pigs observed during the year were affected. Brief reference is made to investigations of tuberculosis in cattle and swine, an account of which by Hastings is noted above. Two of 15 tuberculous hogs examined were affected with the avian or fowl type.

Of 300 head of cattle in 16 herds tested with Johnin, 2.3 per cent were found to be affected with Johne's disease. In control work with infectious abortion of cattle, Hadley has found that abortion vaccine, a preparation containing living abortion germs, is of real value as an immunizing agent when properly prepared, injected while fresh, and employed according to directions. Tests of 2,400 bovine blood samples indicate that the blood test is an effective measure for the control of abortion disease in a community breeding association, and that the measure is practicable.

In agglutination tests by Beach and J. G. Halpin, the blood of about 1,000 birds on the station poultry farm was tested for the presence of white diarrhea organism, of which nearly 11 per cent reacted.

[Diseases of sheep], W. A. Konantz (In *The Shepherd's Guide. Quincy, Ill.: Moorman Mfg. Co., 1923, pp. 18–54*).—This is a summary of information on the more important diseases of sheep.

Management for the control of nodular disease of sheep (*Ohio Sta. Bul. 373 (1923), p. 59*).—In experiments conducted, one lot of sheep was raised in the barn until weaning time, when they were separated from the ewes and put on forage crops, being changed to fresh forage every 10 days. A second lot was raised with infested ewes on permanent blue-grass pasture. Post-mortem examinations showed the first lot of lambs to be entirely free from nodular disease, while the lambs on the permanent pasture all had nodules. "The examination also showed that stomach-worm infestation was 94.5 per cent less in the lambs on fresh forage than in those on permanent pasture. The lambs from the forage plats averaged 14.8 lbs. heavier at slaughtering time, although both lots received practically the same amount of grain."

Abortion in swine, F. B. HADLEY and B. A. BEACH (*Wis. Agr. Col. Ext. Circ. 169 (1924), pp. 7*).—This practical account of abortion in swine includes information on the management of an infected herd.

Hog cholera: Immunization of young pigs, S. PAVÉ and B. RIVERA (*Hog Cholera: Immunización de Lechones. Buenos Aires: Inst. Biol. Soc. Rural Argentina, 1923, pp. 12*).—Experiments on the immunization of young pigs against hog cholera are reported, with the following conclusions:

The simultaneous vaccination of pigs of about three months of age and a weight of from 18 to 20 kg. does not confer sufficient immunity to enable them to resist an attack of hog cholera. To protect suckling pigs against hog cholera the sow should be immunized, and the pigs at an age of from five to eight days should be given an injection of 5 cc. of antihog cholera serum.

The age of the horse, J. L. FRATEUR, trans. by G. MAYALL (*London: Baillière, Tindall & Cox, 1923, pp. XII+13-65, pls. 27*).—This is a translation from the French of the author's small book on the determination of the age of the horse by examination of the teeth.

Poultry diseases and how to prevent or to cure them, H. GRAY (*London: Bazaar, Exchange & Mart Off., 1923, pp. VI+138*).—A brief popular account, in which the subjects discussed are arranged in alphabetical order.

Bacillary white diarrhea, A. J. STEINER (*Kentucky Sta. Circ. 33 (1924), pp. 3-8*).—A summary of information on this disease and means for its control.

RURAL ENGINEERING.

Mechanical engineers' handbook, L. S. MARKS (*New York and London: McGraw-Hill Book Co., Inc., 1924, 2. ed., pp. XVII+1986, figs. 1475*).—This is the second edition of this handbook, the purpose of which is to state the best engineering theory and practice as they stand at the beginning of 1924 in those branches which are of most interest to the mechanical engineer. It is noted that the book has been increased over 8 per cent in size in order to incorporate the new material made available since 1916, in spite of considerable omission and condensation during the process of revision.

Carpentry and contracting (*Chicago: Amer. Tech. Soc., 1922, vols. 1, pp. 442, pls. 23, figs. 548; 2, pp. 404, pls. 80, figs. 484; 3, pp. 466, pls. 8, figs. 459; 4, pp. 473, pls. 11, figs. 464; 5, pp. 457, pls. 7, figs. 37*).—This practical reference work is in five volumes. Volume 1 deals with carpentry, stair building, the steel square, plastering, and painting; volume 2 with blue-print reading, drawing, and sheet metal work; volume 3 with building superintendence, underwriters' requirements, frame structures, and concrete construction work; volume 4 with heating and ventilation, steam and hot water fitting, sanitary appliances, water supply, drainage and venting, domestic hot water supply, and hardware; and volume 5 with estimating, contracts and specifications, legal relations, and building codes.

[Agricultural engineering studies at the Iowa Station] (*Iowa Sta. Rpt. 1923, pp. 8-11*).—Very brief progress reports are presented on studies of concrete fence posts, dairy barns, draft of plows, the horse as a motor, electrical power from the wind, treatment of silo walls, roofing materials, and poultry-house ventilation.

[Agricultural engineering studies at the Wisconsin Station] (*Wisconsin Sta. Bul. 362 (1924), pp. 64-69, figs. 2*).—Studies by F. W. Duffee are said to have shown that greater economy results from running silage cutters at a slower speed than that commonly recommended. This is especially true of the larger machines. With smaller machines the capacity is more often the limiting factor, and more corn can be put through them by operating at a higher speed within the usual limit, but with these machines as with the larger ones the efficiency is much greater at slower speeds. There was an extreme fluctuation in power requirements at the higher speeds. At slower speeds the peak loads did not go nearly so high, and the pull was more uniform and steady. The same applied in general to the elevation of silage by blowing.

Studies on the durability of different kinds of tile under various soil conditions by E. R. Jones and O. R. Zeasman, in cooperation with the U. S. D. A. Bureau of Public Roads, are said to have shown that in general comparatively poor concrete tile stand up well in clay subsoils, but only the best show signs of permanence in peat. This deterioration in peat is less marked where dense walls with low absorption are secured by firm packing and selected material in the manufacturing process. Such material and packing seems to be practicable only in the thick walls of the 12-in. tile and the larger sizes.

It is recommended that engineers accepting concrete tile for use in peat soils should insist upon steam curing, absorption less than 7 per cent of the dry weight of the tile, and a breaking strength of 1,600 lbs. per linear foot for all 30-day-old tile up to 16 in. in diameter, with an increase of 100 lbs. for each inch in diameter thereafter. A strength two-thirds as great as this is considered permissible for concrete tile laid in a clay subsoil and for shale tile laid in any soil for all depths up to 6 ft. At greater depths the greater strength is required for both shale and concrete tile.

Data on the use of sodatol as a farm blasting material are given.

[Irrigation experiments at the New Mexico Station] (*New Mexico Sta. Rpt. 1923, pp. 25–28*).—Data from duty of water investigations for alfalfa, cabbage, small grains, and grapes are briefly presented and discussed.

Data on the duty and the effect of duty of water on alfalfa are reported, indicating that the average duty of water was 4.67 acre-ft. per acre, producing 5.47 tons per acre. The 700-ft. plats produced the most alfalfa, while the smallest yield was obtained from the series receiving the 1 sec.-ft. head. The largest yield per acre-foot of water was produced on the series receiving the smallest head, regardless of the length of plat.

Pumping from wells for irrigation, P. A. EWING (*U. S. Dept. Agr., Farmers' Bul. 1404 (1924), pp. II+28, figs. 4*).—This is a compilation of information pertaining to well construction and the selection, installation, and operation of pumping plants for irrigation.

Study of flocculation phenomenon with microscope, J. R. BAYLIS (*Engin. News-Rec., 92 (1924), No. 18, pp. 768, 769, figs. 4*).—Microscopic studies of coagulated matter in filter beds are reported, indicating that floc which filters excellently and that which passes the beds readily show great differences in structure.

It was found that great danger exists in overcoagulation, in that it produces an easily broken floc which will readily pass rapid sand filter beds. Suspended matter adds toughness to the floc. It is concluded that there should be a rapid mixing of the alum with the water immediately after application.

Public Roads, [April, 1924] (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 2, pp. 32, figs. 54*).—This number of this periodical contains the status of Federal aid as of March 31, 1924, and the following articles:

Impact Tests on Concrete Pavement Slabs, by L. W. Teller (see p. 484); Motor Vehicle Registration 15,092,177, by A. P. Anderson; The Brick Roads of Florida, by C. A. Hogentogler; and Road Material Tests and Inspection News.

Impact tests on concrete pavement slabs, L. W. Teller (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 2, pp. 1–14, figs. 24*).—In a continuation of studies on the magnitude and effect of motor-truck impact begun four years ago (E. S. R., 46, pp. 285, 489), the results of tests of a second series of slabs more comprehensive in its range of types are reported. Specimens 7 ft. square laid on a moderately plastic clay subgrade were used, the wet portion having water standing almost level with the surface and the dry portion being merely damp with capillary moisture. Repeated impacts increasing to the maximum which caused cracking were applied at the corner and at the center of one edge by an impact machine dealing blows closely resembling the impact of motor trucks.

The resistance of road slabs was found to depend in part upon the supporting value of the subgrade. A subgrade of high supporting value materially increased the resistance to impact. The impact resistance of rigid slabs varied as some power of the depth of the slab less than two. In general, plain concrete slabs showed no more resistance to impact delivered at the edge than at a corner. Transverse and longitudinal cracks near the sides of a road slab could be caused by impact delivered at the edge of the slab. Plain concrete of 1:3:6 mix offered a resistance to impact ranging from about 60 to 80 per cent of that of plain concrete of 1:1.5:3 mix. The lean mix also showed more variation in strength.

Reinforcing steel, when present in sufficient amount and so placed as to receive tensile stresses, added to the resistance of concrete slabs to impact. Reinforcing steel placed longitudinally and transversely in equal percentages was more effective in preventing corner failures than the same amount placed in one direction. For a given percentage of steel, small deformed rods closely spaced seemed to be more effective than large deformed rods widely spaced.

There was very little evidence of cushioning by bituminous tops on concrete bases at temperatures of 90° F. or less. There was no evidence that bituminous tops on concrete bases add to the slab strength of the base, with the possible exception of 4 and 6-in. bases on dry subgrades. None of the unreinforced slabs laid on a wet plastic subgrade was capable of resisting impact at the edge of corner equivalent to that of a 5-ton truck. Only 8-in., 1:1.5:3 slabs and 2-in. Topeka tops on 8-in., 1:1.5:3 bases resisted edge or corner impact equivalent to that of a 3-ton truck. All unreinforced slabs of lesser thickness failed under edge or corner impact less than that of a 2-ton truck. When laid on a dry subgrade the 8-in. plain concrete slabs of 1:1.5:3 mix and the 8-in. edge thickness, unreinforced 1:1.5:3 bases with 2-in. Topeka tops resisted edge and corner impact equivalent to that of a 5-ton truck with a safe margin. No other slabs were capable of resisting the 5-ton truck impact even under the favorable conditions of dry subgrade support. A section of 6-in. plain concrete base of 1:1.5:3 mix with a 2-in. Topeka top resisted the edge impact of a 3-ton truck. No other slabs of lesser edge thickness laid on the dry subgrade were capable of resisting impact greater than that of a 2-ton truck.

None of the systems of steel reinforcing tested added sufficiently to the strength of a 6-in., 1:1.5:3 concrete slab to enable it to resist the edge and corner impact of a 3-ton truck when the slab was supported by a very wet plastic subgrade, nor to resist the impact of a 5-ton truck when the slab was supported by a dry subgrade. In some of the tests there was evidence that while the presence of the steel did not assist greatly in preventing the formation of the first crack, it did prevent the development of the crack and the further failure of the slab.

Construction of roads, etc., in national parks and monuments (*U. S. House Represent., 68. Cong., 1. Sess., Com. Pub. Lands, Hearings on H. R. 3682,* *1924, pp. III+136, fig. 1*).—The hearings on a bill authorizing the construction, reconstruction, and improvement of roads, trails, and bridges in the national parks and monuments are presented.

A report of traffic on State highways and county roads in California, 1922 (*Sacramento: Calif. Highway Comn., 1924, pp. 147, pls. 4, figs. 39*).—This report contains data on traffic on California highways during 1922, which was collected by the U. S. D. A. Bureau of Public Roads and the California Highway Commission in cooperation.

Tentative standard methods of sampling and testing highway materials (*U. S. Dept. Agr. Bul. 1216* (*1924*), *pp. 96, pl. 1, figs. 13*).—Tentative standard methods of sampling and testing bituminous and nonbituminous highway material, draintile and culvert pipe, and metallic materials, adopted by the American Association of State Highway Officials and approved by the Secretary of Agriculture for use in connection with Federal-aid road construction, are described.

Far Eastern timbers, C. A. M. Smith (*Far East. Rev., 19* (*1923*), *Nos. 1, pp. 39–41; 2, pp. 134, 135, 140*).—In a contribution from the University of Hongkong data are presented on the mechanical properties and commercial values of a number of Far Eastern timbers.

Asphalt and related bitumens in 1921, K. W. Cottrell (*U. S. Geol. Survey, Min. Resources U. S., 1921, pt. 2, pp. 69–75*).—Data on the production, consumption, imports, and exports of asphalt and related bitumens during 1921 are reported. It is stated that the sales of native asphalt and related bitumens in the United States in 1921 increased 49 per cent in quantity and 64 per cent in value over those in 1920. The sales of asphalt manufactured from domestic petroleum, however, decreased 11 per cent in quantity and 25 per cent in value.

Concrete fence posts, J. B. Davidson (*Iowa Sta. Bul. 219* (*1924*), *pp. 17–44, figs. 30*).—The results of studies begun in 1914 on the practicability, durability, construction, and cost of concrete fence posts are reported. Over 700 posts were tested, of which 48 were reserved for laboratory tests and the remainder used in field tests.

The results showed that very satisfactory fence posts may be made of concrete. The life of a first-class concrete post was found to be very long, little deterioration being evident after a period of nine years. A post with approximately square or round cross section was the strongest for the material used. A dense or rich concrete was found to be necessary to protect the steel reinforcement from corrosion. The minimum amount of cement was needed when sufficient coarse-graded aggregate was used. Four 0.25-in. square twisted reinforcing bars or their equal were needed for the utilization of the full strength of the concrete in the common sizes and types of posts.

It was necessary to place the steel reinforcement at least 0.75 in. below the surface of the concrete to secure maximum strength with adequate protection of the steel from corrosion. It is noted that the opportunity for failure is large with poor workmanship or low-quality materials. A large amount of data on methods and apparatus for construction are included.

Transmission of power by means of pulleys, belts, and shafts, N. D. Steve and F. G. Behrends (*N. Y. Agr. Col.* (*Cornell*) *Ext. Bul. 72* (*1923*), *pp. 42, figs. 49*).—A large amount of practical information on the subject is presented.

Dynamometer tests at Potchefstroom, W. S. H. Cleghorne (*Union So. Africa Dept. Agr. Jour., 8* (*1924*), *No. 3, pp. 340–344, fig. 1*).—Three sets of dynamometer tests of plowing on different soils with different types and sizes of plows, including disk and moldboard plows, are reported and discussed.

Outstanding results of the tests were that the moldboard plows showed a lighter draft throughout than the disk plows when both were used at approximately the same depth. In one set of tests the draft of the moldboard plow per square inch of furrow slice was 28 per cent less than that of the disk plow. However, the disk plow pulverized the ground much better than did the moldboard plow.

The New Jersey multiple brooder house, W. P. Thorp, jr. (*New Jersey Stas., Hints to Poultrymen, 12* (*1924*), *No. 8, pp. 2, pl. 1*).—Working drawings of the New Jersey multiple brooder house and information as to its construction are presented.

Performance of a warm-air furnace with anthracite and bituminous coal, A. P. Kratz (*Jour. Amer. Soc. Heating and Ventilating Engin., 30* (*1924*), *No. 5, pp. 383–389, figs. 5*).—Studies conducted at the University of Illinois to compare the performances of a cast-iron circular radiator type of warm-air furnace when operating with anthracite and bituminous coal, and to determine the effect of the use of a slotted fire pot on operation with bituminous coal, are reported.

Within practical combustion rates the anthracite coal gave higher efficiency and capacity, as indicated by the rise in the temperature of the air from inlet to bonnet, than the bituminous coal for the same combustion rate. However, the reverse was true at combustion rates that were excessive for warm-air furnace practice. The efficiency of bituminous coal was more nearly constant over the whole range of combustion rates than was that of the anthracite coal. More draft was required between the ash pit and smoke outlet to operate the furnace on anthracite coal than on bituminous coal at a given combustion rate. The slotted fire pot gave about 9 per cent greater efficiency and capacity with bituminous coal than the fire pot with slots sealed.

The fire pot temperatures increased with an increase in combustion rate for the anthracite coal, while the reverse was true for the bituminous coal. This is taken to indicate that the higher drafts required to produce the higher combustion rates cause an increase in the amount of air drawn through the slots and result in cooling the fire pot. The temperature of the fire pot was uniformly lower for the bituminous coal than for the anthracite coal. The fire pot temperature was also materially lower for the slotted fire pot than for the one with the slots sealed. More combustion took place above the bituminous coal fuel bed than above the anthracite bed. On the other hand, the radiator temperatures seemed to indicate that the combustion in the case of the bituminous coal was more retarded in the radiator, and that probably the loss due to combustible in the flue gas was greater than it was for the anthracite coal.

In the bituminous coal tests the soot collected on the inner surface of the radiator to a depth of about ⅜ in. at low rates, while at high rates the surface remained practically free from soot.

Selecting wall stacks scientifically for gravity warm air heating systems, V. S. Day (*Jour. Amer. Soc. Heating and Ventilating Engin., 30* (*1924*), *No. 5, pp. 391–394, figs. 2*).—Data from studies conducted at the University of Illinois are presented, showing the heating effect obtainable at the registers of warm air heating systems for a variety of stack areas and register air temperatures, and on the velocities of flow actually obtaining in the stacks of gravity warm-air furnace installations.

RURAL ECONOMICS AND SOCIOLOGY.

[Investigations in agricultural economics at the Iowa Station, 1922–23] (*Iowa Sta. Rpt. 1923, pp. 7, 8*).—Farm organization and farm management survey material from Tama and Warren Counties was analyzed during the year. It was shown that in the first county where farms are large and the farm business is usually considered to be profitable the low prices had brought much more disastrous results than in Warren County where the farms are smaller and farm incomes normally not quite so high. Only about 25 per cent of the 237 Tama County farmers whose businesses were analyzed had anything left for their own labor and management after paying operating expenses and allowing interest on their working capital, whereas in Warren County about 50 per cent of the farms made a positive personal income.

The results of investigations carried on in Humboldt and Calhoun Counties are said to show a decided improvement in the economic status of the farmer over the previous year. The average personal income of 300 farmers was slightly above $1,200, which is attributed largely to the recovery in the price of corn and oats. Complete cost analysis work carried on in cooperation with the Iowa Farm Bureau Federation in Marshall and Shelby Counties shows also a recovery of the farm business.

[Studies in rural economics and sociology at the Wisconsin Station, 1922] (*Wisconsin Sta. Bul. 362 (1924), pp. 69–74, figs. 2*).—Surveys made under the direction of P. E. McNall in Walworth, Washington, and Fond du Lac Counties indicated that the farmers in these counties reduced their cash farm expenses from an average of $1,743 in 1921 to $1,576 in 1922. Greater diversification was practiced. The sales of dairy products decreased, but those of hogs and poultry amounted to $463 more per farm than in 1921. The better crop year of 1922 made possible the carrying over of about $200 worth more feed per farm than in 1921. It was again demonstrated that production per cow is the most important factor in increasing net returns on the dairy farm.

A survey of 20 cooperative companies in three Pacific Coast States and British Columbia was conducted by T. Macklin. Two forms of organization were found to be most frequently used, systems of federated local associations and single central individual membership associations.

From an investigation of tenancy directed by B. H. Hibbard, it was revealed that a considerable number of the farm owners of to-day have at one time or another been hired men and apparently the number of such farm owners is increasing. Also the number of farm owners who at some time had been farm tenants is increasing. The period of tenancy which precedes ownership is becoming somewhat longer, especially in the older portions of the State, and the average age at which men now acquire farms is tending to advance. It is said that boys coming from small farms tend to become tenants a little later in life than those from the large farms. The number of persons on farms who were not born upon farms seems to be increasing.

Research in rural life included two studies, one of rural religious organization and the other of town and country relationships, both conducted by J. H. Kolb, cooperating with the Bureau of Agricultural Economics, U. S. D. A. In the first the various rural church groups were mapped, their constituency enumerated, and the factors contributing to their present-day organization analyzed. In the counties studied, 117 such bodies were found distributed in the proportion of Lutheran 47, Roman Catholic 22, and Reformed or all non-Lutheran Protestant groups 48. In the second investigation, six small towns were selected in three counties, and all of their service institutions in any way in contact with the farming population were minutely studied.

The cost of producing market milk and butterfat on 246 California dairies, R. L. Adams (*California Sta. Bul. 372 (1923), pp. 164, figs. 20*).—This publication embodies the findings obtained on 246 dairies situated in 11 dairying sections of California and includes the records of 14,250 dairy cows. Most of the data were taken for the year ended March 1, 1923, and while there were a few variations from this period the results were held to be comparable. The manner of assembling the data and other details are described in part 1. Part 2 sets forth the actual costs incurred in the production of whole milk or butterfat, presenting the returns for each district individually. The following table summarizes the costs:

Cost of producing milk and butterfat in 11 districts in California, 1922–23.

District.	Cost per 100 lbs. of whole milk.	Cost per pound of butterfat.	District.	Cost per 100 lbs. of whole milk.	Cost per pound of butterfat.
Humboldt-Del Norte:					
Arcata	$2.73	$0.612	Fresno	$2.34	$0.602
Orick-Requa	2.41	.545	Kern	2.23	.501
Marin-Sonoma	....	.492	Los Angeles-Orange	3.73	.970
Alameda-Contra Costa-Santa Clara	2.83	....	San Diego	3.67	.860
Sacramento-Yolo	2.40	.642	San Luis Obispo	....	.536
San Joaquin-Stanislaus	2.63	.600	Monterey-San Benito-Santa Cruz	2.54	.700

Certain of the unit factors involved, or the basic items making up the complete cost measured in terms of time and quantity wherever possible rather than in dollars and cents, are presented in part 3. These show the amount of labor, feed, hauling, supplies, interest on operating capital, and charges for herd, buildings, corrals, and equipment reported in quantity, dollars, and percentages for a stated amount of product. It is expected that with the information thus determined it will be possible to substitute new rates and so to determine costs for any future year. In part 4 are suggested certain ways of increasing the profits from dairying operations.

The farmer and his farm, F. App and C. R. Woodward (*New York: Harcourt, Brace & Co., Inc., 1924, pp. XVI+338, pls. [26], figs. 14*).—This is a popular treatise and handbook on farm management.

[Man-made and seasonal variations in crop yields] (*Ohio Sta. Bul. 373 (1923), pp. 31–35*).—Attention is called to 15-year average yields of corn, oats, wheat, and clover per acre on two similar tracts at the station farm. The cost of the extra treatment given the first tract amounted to $27.20 an acre in four years, for which an increased return of $124.85 was realized.

Seasonal variations in crop yields on five tenth-acre plats and on a tract of 40 acres, all receiving uniform treatment, are tabulated, and statistics of yields in the State as a whole and in the United States are cited by way of showing how widely crop yields vary and illustrating the great difficulty of adjusting production to consumption.

The wider use of agricultural equipment to the end of reducing the manual labor required [trans. title], G. Quintanilla (*Bol. Agr. Téc. y Econ. [Spain], 15 (1923), No. 178, pp. 918–922*).—Some estimates are given of the proportion of the total expense of the cultivation of wheat that is due to labor and of the labor distribution throughout the year. The more general cooperative use of machinery among the small farmers of Spain is urged.

The law of allotments and allotment gardens (England and Wales), E. L. Mitchell (*London: P. S. King & Son, Ltd., 1922, 3. ed., pp. IX+147*).—The duties and powers of local authorities with regard to the provisions of allotments and allotment gardens under the allotment acts, 1908 to 1922, are set forth, and statutory provisions are explained. The rules and regulations of the Ministry of Agriculture and Fisheries and other provisions are noted.

Rural holdings [in Norway], 1916–1920 (*De Faste Eiendommer, 1916–1920. Christiania: Statis, Centralbyrå, 1923, pp. [7]+89+172, fig. 1*).—Notes and tabulated statistics in this official publication set forth the number and character of rural holdings, their subdivision, the occupations of holders and means of landholding, valuation and prices, and sales.

Live stock insurance in Belgium (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 2 (1924), No. 1, pp. 90–104*).—Some extracts from the rules of local livestock insurance societies are cited as typical and as indicative of the aims and activities of these organizations. Statistics are presented to show their number and importance.

The agricultural landowner's handbook on taxes, rates, and tithe (England and Wales), R. S. GARDINER (*London: Cent. Landowners' Assoc., 1923, pp. 109*).—Information is supplied by way of technical advice and assistance in matters connected with English income-tax schedules, the supertax, and other charges, including the tithe rent charge.

Farmers' income tax, 1923–1924, with explanatory notes on tithes and land tax, C. H. TOLLEY (In *Year Book of the National Farmers' Union for 1924. London: The Union, 1924, pp. 83–99*).—Notes are offered particularly for tenant farmers and farmers owning their farms and with general reference to legal aspects of rates and allowances, tithes, and the land tax.

Sources of supply and conditions of employment of harvest labor in the wheat belt, D. D. LESCOHIER (*U. S. Dept. Agr. Bul. 1211 (1924), pp. 27, figs. 10*).—The facts presented here were obtained from personal interviews with 1,174 harvesters, many of them when they applied for harvest work at Federal-State employment offices in the wheat belt or on the streets and around the depots and railroad yards of wheat towns or working on farms. This and two other publications (E. S. R., 47, p. 192; 51, p. 295) comprise a survey of several phases of the wheat-harvest labor problem. The topics discussed here on the basis of answers received are the localities from which harvest hands came, regular occupations, amount of unemployment, experience in harvesting, methods of transportation to place of work, objectionable aspects of travel on freight trains, methods of obtaining employment, the difficulty of obtaining reemployment, wage rates in the harvest, net earnings of harvest hands, and the extent and direction of migration. The appendix gives two tables showing, respectively, the relative earnings and expenses of 32 harvesters in the 1921 harvest whose earnings had been less than $100 and expenses $50 or over at the time of interview and of 83 whose earnings had been $100 or more up to the time of interview.

It appeared from this study that the greater portion of the harvest labor supply comes from the States west of central Ohio. State and Federal officials are urged not to attract industrial workers in the East to the harvest by official advertising in view of the heavy expense for travel to and within the harvest territory. It is recommended that special harvest excursions at reduced rates should be provided by the railroads, with round-trip rates. Further, it is held that more comprehensive machinery should be provided by the cooperation of Federal-State employment officials and State and county agricultural officials for the redistribution of harvest hands. The county agent or the farm bureau should be given definite instruction, guidance, and responsibility for forwarding the labor of one county as soon as set free to the next area where it is needed.

The tariff in relation to agriculture and foreign trade, B. M. ANDERSON, JR. (*Acad. Polit. Sci. New York, Proc., 10 (1924), No. 4, pp. 68–80*).—Adjustments in currency and prices in the United States and foreign countries in recent years and financial policies as affected by international trade and competition are reviewed. It is maintained that certain tariffs have brought embarrassment to agriculture. It is held that the solution to world problems will be found in the restoration of sound money, sound finances, open markets, and a liberal international trade policy, together with freedom to private enterprise.

The tariff in an unbalanced world, B. M. ANDERSON, JR. (*Chase Econ. Bul., 3 (1923), No. 5, pp. 16*).—This is the same as the above.

The agricultural problem in the eastern Republic of Uruguay, A. BOERGER and G. FISCHER (*El Problema Agrícola de la República Oriental del Uruguay. Montevideo:* [*Govt.*], *1922, pp. 116, figs. 7*).—The discussion of the circumstances of agricultural production in Uruguay is contributed by Boerger, who refutes the allegation that agriculture in Uruguay is fundamentally decadent. Crop failures in recent years are said to have been due primarily to bad seasons. Economic conditions, particularly those attendant upon the World War and the competition between agricultural and livestock industries, are set forth. Technical processes and the means of increasing the output are discussed by Fischer. The supply of water for irrigation, the use of fertilizers and motor power, plant selection, and protection against pests and diseases are his main topics. The authors collaborate in submitting conclusions and recommendations as to future policies on the part of the Government.

European reconstruction.—[XIV], **Food supplies** (*Manchester Guardian Com., 1923, Apr. 26, pp. 811–836, VII, figs. 11*).—The following papers covering various phases of the world's food production are published here: Introduction—Europe and Its Food Imports; Food Production and Consumption in Europe, by E. F. Wise; The American Grain Situation, by D. Friday; The Position of British Agriculture, by C. S. Orwin; Food Production in Ireland; Canada as a Source of Food Supplies, by J. A. Stevenson; Argentine Food Supplies, by M. Bryant; Australia's Food Supplies, Present and Future, by J. Cook; The Future of Russian Agriculture, by M. Sering; The Danube Countries as Food Sources, by G. Jonescu-Sisesti; The Indian Consumption and Export of Foodstuffs, by H. A. F. Lindsay; Refrigerated Cargoes, by D. W. Caddick; and The Sugar Industry—Its Position and Prospects.

Social and economic problems of English country life: A farmer's view, R. R. ROBBINS (*In Year Book of the National Farmers' Union for 1924. London: The Union, 1924, pp. 65–80*).—The author comments upon the function of the farmer in the organization of the farming industry, the influence upon agricultural development of political and economic conditions, the cumulative effect of the corn laws repeal, the handicaps suffered by the British farmer when competing with imported supplies, the pre-war stabilization of the industry and its effect upon the countryside, State control of food production in war, war legacies, post-war policy, and certain points in connection with an agricultural policy for the future.

Agricultural survey of Europe: The Danube Basin—Part I, L. G. MICHAEL (*U. S. Dept. Agr. Bul. 1234 (1924), pp. 111, figs. 12*).—The data noted earlier in mimeographed form (E. S. R., 48, p. 529; 49, p. 93; 50, p. 296) are brought together here, with revisions and additions.

The organization of the co-operative dairies and of their federations in Switzerland, O. HOWALD (*Internatl. Rev. Agr. Econ.* [*Rome*], *n. ser., 2 (1924),* *No. 1, pp. 62–89*).—A historic and descriptive account is given setting forth the purpose and organization of Swiss cooperative dairy societies, especially of the three principal types including the cooperative dairy, cooperative cheese factories with the sale of milk, and cheese factories working independently. Federations were organized as a means of defense against the organizations of buyers and the condensed milk factories. A summary is given of rules, organization, work, and results.

Crops and Markets, [May, 1924] (*U. S. Dept. Agr., Crops and Markets, 1* (*1924*), *Nos. 18, pp. 273–288; 19, pp. 289–304; 20, pp. 305–320, fig. 1; 21, pp. 321–336; 22, pp. 337–352*).—The usual abstracts of current weekly market information, notes on the position in the market of important classes of crops and livestock, tabulations of weekly receipts and prices with summaries and comparisons, brief notes on foreign crops and markets, and special articles are presented in these numbers.

Monthly Supplement to Crops and Markets, [May, 1924] (*U. S. Dept. Agr., Crops and Markets, 1* (*1924*), *Sup. 5, pp. 145–168, figs. 5*).—The usual plan is followed in this number of giving tabulated current and comparative statistics of crops, livestock and livestock products, dairy and poultry products, fruits and vegetables, grain, seeds, cotton, foreign crops and markets, and prices. Special articles are presented, noting the prospects on May 1 for the peach crop in the Southern States, describing Texas Honey Ball melons, and setting forth the points farthest north where cotton crops have been produced in census years since 1839, the cantaloup supply and prices, and the demand for condensed milk. Other brief notes are included.

Seed statistics (*U. S. Dept. Agr., Statis. Bul. 2* (*1924*), *pp. 100, pl. 1*).—This publication was prepared under the direction of J. J. Window, jr. It is the second of a series noted earlier (E. S. R., 49, p. 892). Statistics of seeds produced primarily for planting and for oil production have been compiled from records in the Bureau of Agricultural Economics, U. S. D. A., and the Bureau of the Census and the Bureau of Foreign and Domestic Commerce of the Department of Commerce for the year ended May 31, 1923, with comparable data for earlier years.

Sheep, lamb, mutton, and wool statistics (*U. S. Dept. Agr., Statis. Bul. 3* (*1924*), *pp. 100*).—Statistics have been compiled under the direction of F. C. Fitch and J. J. Window, jr., for another of the same series as the above. They are for the year ended March 31, 1923, with comparable data for earlier years.

Preliminary statistics of agricultural production in Spain (*Avance Estadístico de la Producción Agricola en España. Madrid: Junta Consult. Agron., 1923, pp. VII+447*).—Statistics have been compiled by provinces from the returns obtained by 50 agricultural specialists in 1922 by means of questionnaires.

Acreage and yields of agriculture in the Republic of Austria for the year 1921 (*Anbauflächen und Ernteergebnisse im Gebiete der Republik Österreich im Jahre 1921. Vienna: Österr. Bundesmin. Land u. Forstw., 1922, pp. 31*).—This annual report continues the series previously noted (E. S. R., 46, p. 293).

Acreage and yields of agriculture in the Republic of Austria for the year 1922 (*Anbauflächen und Ernteergebnisse in der Republik Österreich im Jahre 1922. Vienna: Österr. Bundesmin. Land u. Forstw., 1923, pp. 13*).—This annual report succeeds the one noted above.

[Land tenure and settlement and agriculture in New Zealand], M. FRASER (*New Zeal. Off. Yearbook, 32 (1924) pp. 356–413, pls. 4, figs. 4*).—Annual statistics are presented along lines similar to the earlier report (E. S. R., 50, p. 693).

AGRICULTURAL EDUCATION.

The Iowa plan of observation and practice teaching in the training of rural teachers, A. D. CORDTS (*U. S. Bur. Ed., Rural School Leaflet 16 (1923), pp. 4*).—Under this plan the student in the first year of the college course spends one hour each week for six weeks observing expert teaching in the campus rural school, taking notes and holding conferences with the teacher. In order to gain practice in teaching the student teacher is excused from her work in the college for one month and goes to live in the rural district where she is to learn to teach a rural school. She works as assistant to the regular teacher and takes part in evening community meetings. A part of her assignment also is to become acquainted with the parents who have children in school and to become familiar with the various forms of country life existing in the community.

State training schools for teachers of small holders, 1922 [trans. title], M. F. NILSSEN (*[Norway] Landbr. Direkt. Årsberet., Tillegg K, Statens Småbrukslaerersкole Beret., 1922, pp. 146, figs. 57*).—An annual report is presented succeeding one noted earlier (E. S. R., 50, p. 94).

Report of the State schools for teachers of home economics for the school year 1922–23 [trans. title], B. TORP (*[Norway] Landbr. Direkt. Beret., Tillegg M, Beret. Statens Laererinneskole Husstell, 1922–23, pp. 20*).—An annual report is submitted for the later year succeeding one previously noted (E. S. R., 50, p. 94).

Agricultural education [in Northern Ireland] (*North. Ireland Min. Agr., Ann. Gen. Rpt., 1 (1922), pp. 7–14; App., pp. 8–35, 51–69*).—The Ministry of Agriculture of the Government of Northern Ireland submits its first annual general report. Agricultural education is under the direct control and supervision of the ministry, and no county participates in the schemes of development and improvement unless the funds are raised locally for the purpose. A scheme of itinerant instruction was in general operation in the year of this report, one instructor being employed in each of four counties and two in each of two counties. Their principal duties consisted in giving practical and technical advice in matters relating to farming, the purchase and use of feeding stuffs and fertilizers, and the management and breeding of livestock; carrying out field and livestock experiments and demonstrations; lecturing on agricultural subjects at centers throughout the county; conducting short winter courses of instruction for farmers' sons; and organizing educational exhibits at agricultural shows.

Brief notes are included with reference to winter agricultural classes and specific agricultural schools and colleges. Appendixes present in detail the instructions by the Ministry of Agriculture with reference to agricultural education, prospectuses of schools, and other matters.

Agricultural education in South Africa, R. W. THORNTON (*Union So. Africa Dept. Agr. Jour., 8 (1923), No. 2, pp. 117–128, figs. 6*).—A brief review is contributed of the history of agricultural education in the schools at Elsenburg, Cedara, Potchefstroom, Grootfontein, and Glen. Courses of instruction are briefly described.

[Reports on home economics training in Norway, 1921 and 1922] (*[Norway], Landbr. Direkt. Årsberet., Tillegg N, Beret. Husmorundervis., 1921, pp. [3]+VI+104, fig. 1; 1922, pp. [3]+VII+49, fig. 1*).—These annual reports succeed those noted earlier (E. S. R., 48, p. 496).

Proceedings [of the] sixteenth annual meeting, American Home Economics Association (*Jour. Home Econ., 15 (1923), No. 10, pp. 521–612, pl. 1*).—The proceedings of the meeting at Chicago, July 30 to August 4, 1923, are published here, together with abstracts of papers. Those read before the home economics education section are The College and the Demand for Teachers in Secondary Schools, by R. Wardall; Basic Principles of Teacher-training Courses in Home Economics, by C. M. Winchell; and Home Economics in Elementary Schools, by G. Schermerhorn. The papers read in the home economics extension section are The Home Economics Extension of the Future, by G. E. Frysinger, and Extension Work and the Resident Department, by N. S. Knowles.

Symposium on "extension work in agronomy" (*Jour. Amer. Soc. Agron., 16 (1924) No. 5, pp. 305–352*).—A number of papers read as a part of this symposium at the meeting of the American Society of Agronomy in Chicago, November 13, 1923, are published here.

Purdue handbook of agricultural facts, 1924, edited by I. J. Mathews (*Indiana Sta., Handb. Agr. Facts, 1924, pp. 223, figs. 35*).—This is a compilation of practical reference material with respect to agriculture and farm home problems for the use of farmers, home makers, county and home demonstration agents, vocational teachers, and other agricultural workers.

Ohio State University College of Agriculture Extension Service Handbook (*[Columbus]: Ohio State Univ. Col. Agr., [1924], pp. 168, pl. 1, figs. 9*).—This handbook has been prepared for extension workers giving reference material in classified subjects.

The soil and its management, M. F. Miller (*Boston and London: Ginn & Co., 1924, pp. VI+386, pl. 1, figs. 236*).—This book has been prepared primarily as a text on soils for high schools teaching vocational agriculture, normal schools offering elementary courses in this subject, and short courses in colleges of agriculture. The nature of soils, the relation of soil and moisture, plant foods, and the proper management of farm lands in the way of maintaining the organic matter in the soil and adding to its fertility are some of the general topics under which the subject matter of the individual chapters may be grouped. One chapter is included on the agricultural lands of the United States. The final chapter is a brief reference to soil classification and soil mapping.

Preliminary studies and demonstrations for corn club members, A. D. Cobb (*Del. Univ. Agr. Ext. Circ. 15 (1924), pp. 20, figs. 7*).—Material presented here has been prepared to aid corn club members in their study of corn and to furnish material for programs and demonstrations at club meetings.

Growing sweet potatoes, C. Woolsey (*Ark. Agr. Col. Ext. Circ. 158 (1924), pp. 11, figs. 7*).—Information has been compiled for the use of club members.

Woody plants in winter, E. L. Palmer (*Cornell Rural School Leaflet, 17 (1924), No. 3, pp. 48, figs. 150*).—This is a manual intended for pupils in rural schools.

Southern woodland trees, J. B. Berry (*Yonkers, N. Y.: World Book Co., 1924, pp. X+214, figs. 106*).—This is a guide to the identification of trees and woods to accompany a handbook and text previously noted (E. S. R., 50, p. 695).

Questions and answers on marketing (*[University Farm, St. Paul]: Minn. Col. Agr., Ext. Div., [1924], pp. 43*).—A brief introductory note on The Extension Responsibility in Cooperative Marketing, by F. W. Peck, and questions dealing with the specific problems of butter, milk, livestock, egg, wool, wheat, and potato production as answered by outstanding authorities at the Eleventh Annual Extension Conference, November 19 and 20, 1923, make up this pamphlet.

Cotton trade guide and student's manual, T. S. Miller, sr. (*Austin, Tex.: E. L. Steck Co., 1923, 4. ed., rev., pp. XI+450, pls. 3, figs. 27*).—This is a revision of a textbook previously noted (E. S. R., 34, p. 595).

The child: His nature and his needs, edited by M. V. O'Shea (*Valparaiso, Ind.: Childrens Foundation, 1924, pp. IX+516, pls. 24, figs. 17*).—This is the first volume to be published by the recently organized Childrens Foundation. It consists of a review of the most important conclusions and authenticated experiences in the study of child nature and education, drawn up for the practical use of and application by parents, teachers, social workers, and others. Three divisions present, respectively, surveys of present-day knowledge of child nature, child well-being, and child education. Chapters or divisions have been prepared by authorities in the particular phase of the subject covered.

An experiment in teaching family relationships in the public schools, M. E. Turner (*Vocat. Ed. Mag., 2 (1924), No. 10, pp. 843–845*).—The problem chosen in the study of ideal family relationships and the results achieved in a course for a home economics class are described, the principal results having appeared in a modification of attitudes and habits on the part of girls in the class. The unit course in family relationships for the tenth grade of the Ames, Iowa, High School in 1924 is given in full.

Results of tests in home economics, C. M. Brown (*Vocat. Ed. Mag., 2 (1924), No. 10, pp. 836–840*).—The author sets forth the experience of the division of home economics at the University of Minnesota, with objective tests, and suggestions derived therefrom are offered as to procedure.

Food study outlines for Texas high schools, E. V. Lacey (*Tex. State Bd. Vocat. Ed. Bul. 162 (1923), pp. 38*).—Two courses of study in foods consisting of two units each are outlined here. The first is based upon breakfast and miscellaneous problems, and the second upon luncheon and dinner problems.

Applied design and clothing, M. Marshall (*Tex. State Bd. Vocat. Ed. Bul. 165 (1923), pp. 40*).—Suggestive outlines are offered for courses in applied design, costume design, and house planning and furnishing, as well as in elementary and advanced clothing and dressmaking and millinery. Numerous references are listed.

Arizona boys' and girls' clubs.—Garment making, M. P. Lockwood (*Ariz. Agr. Col. Ext. Circ. 47 (1924), pp. 50, figs. 8*).—Material has been compiled for the use of leaders of sewing clubs, including outlines of exercises and directions for the required operations.

Play production for the country theatre, A. M. Drummond (*N. Y. Agr. Col. (Cornell) Ext. Bul. 82 (1924), pp. 78, figs. 46*).—Practical hints illustrated with diagrams, photographs, and sketches are brought together here for the assistance of those engaged in amateur dramatics, especially for country communities.

Agricultural exhibits and fairs, C. E. Brehm (*Tenn. Agr. Col. Ext. Pub. 127 (1924), pp. 50, figs. 8*).—The aim of this publication is to set forth the purpose of fairs, to describe methods of organization and management of community and county fairs, and to make suggestions with reference to the catalogue and premium list and other details.

MISCELLANEOUS.

Annual Reports of the Department of Agriculture for the year ended June 30, 1923 (*U. S. Dept. Agr. Rpts. 1923, pp. IX+716*).—This contains the reports of the Secretary and heads of bureaus and other administrative officers. The various reports are also issued as separates.

List of bulletins of the agricultural experiment stations in the United States from their establishment to the end of 1920 (*U. S. Dept. Agr. Bul. 1199 (1924), pp. 186*).—This bulletin lists approximately 12,500 of the 17,500 or more publications of the State experiment stations (including those of Alaska and the insular possessions) from 1875 to 1920, inclusive. It is confined primarily to the regular bulletin series of the stations. It does not include circulars and other more or less ephemeral publications; annual reports, except such as are numbered as bulletins; nor scientific contributions from the stations which have appeared in the *Journal of Agricultural Research* or other scientific periodicals.

The work of preparing the list has been done mainly by E. L. Ogden and M. L. Gericke.

Annual Report [of Iowa Station, 1923], C. F. CURTISS and W. H. STEVENSON (*Iowa Sta. Rpt. 1923, pp. 63*).—This contains a report on the work of the station, including the organization list and a financial statement for the fiscal year ended June 30, 1923. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-fourth Annual Report [of New Mexico Station, 1923], F. GARCIA (*New Mexico Sta. Rpt. 1923, pp. 50, figs. 2*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the year ended June 30, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-second Annual Report of [Ohio Station, 1923], C. G. WILLIAMS (*Ohio Sta. Bul. 373 (1923), pp. 98, figs. 9*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1923, and a report of the director summarizing the work of the station during the year. The current experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Annual Report of [South Dakota Station, 1923], J. W. WILSON ET AL. (*South Dakota Sta. Rpt. 1923, pp. 36*).—This contains a report by the director on the organization, work, and publications of the station; a financial statement for the fiscal year ended June 30, 1923; and departmental reports. The experimental work recorded is for the most part abstracted elsewhere in this issue.

New facts in farm science: The fortieth annual report of the director, 1922–1923, H. L. RUSSELL and F. B. MORRISON (*Wisconsin Sta. Bul. 362 (1924), pp. 115, figs. 40*).—This contains an account of the activities of the station, a list of the station publications of the year, and a financial statement as to the Federal funds for the fiscal year ended June 30, 1923. The experimental features not previously reported are for the most part abstracted elsewhere in this issue. A brief historical summary of the accomplishments of the station from 1903 to 1923 is also included.

NOTES.

Arizona University and Station.—The appointments are reported of Dr. Rubert Burley Streets as assistant professor of plant pathology and assistant plant pathologist, Malcolm Frederic Wharton as instructor in horticulture and assistant horticulturist, Howard Vernon Smith as assistant agricultural chemist, and Everett Lee Scott as assistant animal husbandman.

Colorado College and Station.—The new administration building has been completed, the station offices on the second floor being occupied during August.

William L. May, assistant botanist in the station from 1919 to 1920 and subsequently in charge of the weed control work of the State entomologist, died at his field station in Paonia September 5.

George M. List, chief deputy to the State entomologist and assistant professor of entomology and zoology, has been granted a year's leave of absence to take up graduate work at the Iowa College.

Dr. L. W. Durrell, assistant chief in plant pathology in the Iowa Station, has been appointed head of the department of botany in the college and in charge of the research work in plant pathology to fill the vacancy occasioned by the death of Dr. A. K. Peitersen, February 23. L. P. McCann, agricultural agent in Mesa County, has accepted an appointment as associate professor of animal husbandry.

Connecticut College and Stations.—The college has established a hall of fame for agriculture. Among the first three men to receive the honor of admission was Dr. E. H. Jenkins, director emeritus of the stations.

The laboratory and office building at the Tobacco Substation at Windsor has been completed. C. M. Slagg, in charge of this substation, resigned April 1 to accept a similar position with the Canadian Department of Agriculture. Dr. N. T. Nelson has been appointed physiologist at the substation.

The appointment of a station assistant in botany has been authorized, the object being to strengthen the State inspection of orchards and nurseries through the addition of a plant pathologist to the inspecting staff and to increase the attention given to the diseases of vegetable crops.

Georgia Station.—The Chemical Warfare Service, U. S. Army, is cooperating with the station in studies of methods of combating the boll weevil.

Idaho University and Station.—The course of study in the College of Agriculture has been completely revised and new major courses are being offered in agricultural engineering and general agriculture. Students selecting agricultural engineering as their major will have a choice within the department between irrigation and power farming. The course in general agriculture is offered to meet the needs of students interested in securing a broad knowledge of agricultural problems to prepare them to act as county agents or to operate farms for themselves.

Charles C. Prouty has been appointed assistant bacteriologist in the station vice Harold W. Batchelor, who is pursuing graduate work at the University of Wisconsin.

Kansas College and Station.—An experiment conducted during the first half of the present year has shown that ultraviolet light as well as sunlight may have a distinctly beneficial effect on egg production and on fertility and the hatchability of eggs. Three pens of 12 White Leghorn pullets each were used in the experiment, all receiving the same feed which was adequate for vitamins A, B, and C, and possibly vitamin D. The pullets in one pen were kept in a large experimental building and received no direct sunlight. Those in another pen were kept in the same building but exposed to untraviolet light for two 10-minute periods daily, while the third pen was kept in a nearby colony house and had a run of a small sunny yard. Between January 23 and May 11 the respective egg production was 134, 492, and 597 eggs, the percentages of fertile eggs 34, 60, and 35, and the percentages of fertile eggs hatched 32.6, 75.6, and 58.4.

The erection this fall of a radio broadcasting station to cost $20,000 has been authorized. It is expected that this will provide excellent facilities for this service.

Recent resignations include W. S. Wiedorn, assistant professor of landscape gardening; W. P. Hayes, assistant professor of entomology; and P. C. McGilliard, instructor in dairy husbandry. Arthur Helder has been appointed assistant professor of landscape gardening, Harold Hedges instructor in marketing, W. H. Riddell instructor in dairy husbandry, and Harry R. Bryson assistant in entomology.

Massachusetts College and Station.—A home economics course has been sanctioned by the State Commissioner of Budget and Finance, with special emphasis upon training for home making. Miss Helen Knowlton has been appointed assistant professor of home economics to be in charge of the work.

A barn for wrapper leaf tobacco work and a head house for the agronomy greenhouse have recently been completed for the station.

Dr. Arao Itano, assistant professor of microbiology, resigned September 1 to become the head of the chemistry and microbiology department of the Ohara Institute for Agricultural Research at Okayama, Japan. He has been succeeded by Dr. Chester H. Werkman, instructor in bacteriology in the Iowa College.

Montana College and Station.—Contracts have been let and work is proceeding on two new buildings for the agricultural division, namely, an office and classroom building for the poultry department and a beef cattle barn. These buildings will cost about $30,000.

Dr. W. J. Hall, assistant veterinarian, has resigned to accept a position in the meat inspection of the U. S. D. A. Bureau of Animal Industry, at Seattle, Wash., and was succeeded October 1 by Dr. Erwin Jungherr.

Cornell University.—Dr. C. E. Ladd has been appointed director of the agricultural extension service to succeed M. C. Burritt, who resigned June 30.

New York State Station.—Frank H. Lathrop, Ph. D., associate in research (entomology), resigned September 1 to become head of the department of entomology at Clemson College and the South Carolina Station and State entomologist.

North Carolina College and Station.—Dr. William A. Withers, professor of chemistry in the college since 1889 and associated with the chemical work of the station since 1884, died June 20 at the age of 60 years.

Doctor Withers was a native of North Carolina and received the bachelor's, master's, and doctor's degrees from Davidson College in that State, also studying chemistry at Cornell University from 1888 to 1890. He had been vice president of the college since 1916, director of the summer school since 1917, State chemist in 1897–98, and State statistical agent for the U. S. Department of Agriculture from 1895 to 1902 and 1905 to 1915. In the station he had served as chemist from 1897 to 1921 and as acting director from 1897 to 1899. He was a member of numerous scientific societies, a fellow of the American

Association for the Advancement of Science, and president of the Association of Official Agricultural Chemists in 1909–10. Among his best-known contributions to science were those relating to nitrification, food adulteration, and the toxic principle of cotton seed.

Porto Rico Federal Station.—Dr. Gerard Dikmans, for several years assistant veterinarian and parasitologist at the Louisiana Stations, has been appointed parasitologist.

Texas College.—The establishment of a graduate school has been authorized with Dr. Charles Puryear, previously dean of the college, as dean.

Vermont University.—A chapel to seat 1,000 students and endowed to provide for the securing of eminent speakers throughout the year has been given by James B. Wilbur and will be known as the Ira Allen Chapel.

A fellowship of $1,000 for three years for graduate work in the College of Agriculture in dairy husbandry has been given by George H. Walker, of Needham, Mass., the founder of the Walker-Gordon Laboratory Co. The donor has suggested a study of the production and handling of milk on relatively small farms and plants, with particular reference to producing a product which is commercially and bacteriologically clean and uniform and available at reasonable cost.

Virginia Station.—G. S. Ralston, field horticulturist, has resigned, effective September 1. R. A. Runnells, D. V. M., assistant professor of animal pathology in the Michigan College, has been appointed associate animal pathologist and has entered upon his duties.

Virigina Truck Station.—Ray J. Davis has resigned as associate plant pathologist and was succeeded September 1 by Frank P. McWhorter.

West Virginia University and Station.—Dr. C. A. Leuder, head of the department of veterinary medicine and station veterinarian, has resigned, effective October 1, when he becomes rowing coach of Cornell University. E. L. Shaw, instructor in animal husbandry and sheep specialist in the extension service, has resigned to go into the sheep business in Ohio. Other resignations include those of Miss Marion F. Breck and Miss Ruth K. Trail, assistant professors of home economics, and J. H. Shaffer, junior farm economist. Leaves of absences for advanced work have been granted to E. A. Livesay, head of the animal husbandry department, H. O. Henderson, associate dairy husbandman, and K. C. Westover, assistant horticulturist. S. E. Wheeler has been appointed instructor in animal husbandry.

U. S. Range Livestock Experiment Station.—The first range livestock experiment station in this country has been established at Miles City, Mont., where a tract of 55,000 acres of grazing land and 2,000 acres of irrigated land formerly occupied by the Fort Keogh Military Reservation was transferred by act of Congress in April, 1924, to the U. S. Department of Agriculture. Buildings and equipment valued at more than $200,000 are available, including two barns built in 1920 at a cost of $12,000 each and about 75 miles of fencing.

The station will be devoted to a study of range livestock problems and will be under the immediate supervision of the Animal Husbandry Division of the Bureau of Animal Industry with the cooperation of the Montana Experiment Station and other bureaus and divisions of the Department interested in livestock problems. Plans have been made to maintain an initial stock of 1,000 beef breeding cattle, a band of sheep, hogs, horses, and turkeys.

University of the Philippines.—The College of Agriculture has converted its silk house into a commodious soil technology building. A tool and implement building has been erected, as well as a slaughterhouse and a central poultry house with an incubator cellar, killing room, feed room, salesroom, a room for both natural and artificial brooding, and a poultry hospital.

Dr. Robert L. Pendleton, director of agriculture in Gwalior State, India, has been appointed professor of soil technology and in charge of the work in soils in the department of agronomy.

Fertilizer Testing Station in China.—The Ling Naam Agricultural College, which is the College of Agriculture of Canton Christian College, is contemplating the establishment of a fertilizer testing station. It is expected that its work will include analyses of soils, crops, and fertilizers; tests of fertilizers and other combinations of various soils and crops; lectures and laboratory instruction; and special short courses on the use of fertilizers and other extension work.

The station is to have its headquarters at the college with the head of the department of agronomy as director. Acquisition of about 60 acres of land under lease at $1,800 per year or by purchase at a cost of $45,000 is expected. The plans also contemplate the erection of a fertilizer building to cost, with equipment, about $40,000, together with two residences to cost $5,000 each and several cottages for workers to cost about $2,800. The main building would contain classrooms, a laboratory, and living quarters for at least 20 students. The expense of maintenance is estimated at about $6,500 per annum.

Experimental Farm at Edinburgh and East of Scotland College of Agriculture.—Because of various difficulties, this institution was unable to obtain a farm for permanent experimental work until November, 1923. At this time possession was obtained of a farm of somewhat over 600 acres, of which about 230 acres are arable. About half the cost of the farm was derived from funds of the Board of Agriculture for Scotland, one-fourth from the Scottish Education Department, and the remainder from funds collected before the war from private subscription and public sources.

During the present season a survey of the farm has been completed, plans formulated, and a considerable amount of experimental work inaugurated. A field of about 12 acres has been reserved for variety trials, and a second field for cultural tests. A meteorological station is to be maintained, including the installation of a set of lysimeters. Manurial tests are to be carried on, as are also pasture trials for various grass mixtures for grazing.

The farm buildings are being remodeled to permit of their utilization for cattle feeding work. It is planned to erect an implement demonstration shed in the near future for instruction purposes.

Correlation of Meteorological and Crop Data in Great Britain.—In order to extend the knowledge of critical dates in plant growth as related to meteorological conditions, the Meteorological Committee of the Agricultural Research Council of Great Britain is arranging for a series of observation stations. About 15 of these stations are to be established in England, Wales, and Scotland, to be located at the experimental farms belonging to agricultural colleges.

Observations will be required of all stations on humidity (three times a day), air temperature (except maximum in sun), soil temperature at 4 and 8 inch depths, wind movement, rainfall, and sunshine. It is also hoped that it will be possible to record air temperature (maximum in sun), solar radiation, cloud, weather, barometer, and attached thermometer, and soil temperature at 2 foot depths.

Coincident with these, agricultural observations will be made on wheat, barley, oats, turnips, swedes, and meadow hay as to variety, soil characteristics, previous cropping, manuring, cultural operations, dates of sowing, appearance above ground, breaking into ear, flowering, and harvest, yield per acre of grain and straw, bushel weight, and attacks of diseases and animal pests. Ultimately it is hoped to include horticultural observations and phenological data for a large range of trees and perennial wild plants. It is expected to begin operations this fall.

Fourth International Seed Testing Congress.—This congress was held in Cambridge July 7 to 12, with vists to the Rothamsted Experimental Station and the British Empire Exhibition, and was followed by excursions to the warehouse and seed cleaning plant of the Eastern Counties Farmers' Cooperative Association, Ltd., the seed establishment of Sutton & Sons, and the Royal Botanic Gardens at Kew.

Official delegates were present from 25 countries and the International Institute of Agriculture. A number of officials of the U. S. Department of Agriculture were in attendance.

Action was taken whereby the European Seed Testing Association, organized at the Third International Seed Testing Congress in Copenhagen in 1921, was made fully international in scope. An invitation from the International Institute of Agriculture to hold the fifth congress in Rome was accepted, the date agreed upon being the first half of May, 1927.

Miscellaneous.—The foundation stone of the new laboratory building of the Research Institute in Animal Pathology at the Royal Veterinary College, London, was laid recently. The site for the building has been provided by the college, and a considerable share of the cost of the building will be defrayed by the Development Commission. It is hoped that the institute will be completed and opened this autumn.

Under a bequest of the late Peter Waite, Waite Institute will soon be opened on a large estate near Adelaide, South Australia, for research in science and agriculture as applied to the Southern Hemisphere. The institute is considered to be unique in its scope, size, and equipment, and will have an assured annual income of £8,000. Dr. A. E. V. Richardson, dean of the faculty of agriculture and superintendent of agriculture in Victoria, has been appointed director.

Dr. H. M. Leake, late director of agriculture of the United Provinces, India, and late principal of the Cawnpore Agricultural College, has been appointed principal of the Imperial College of Tropical Agriculture, Trinidad, vice Sir Francis Watts, who has retired with the title of principal emeritus.

At the annual convention of the American Association of Nurserymen at Atlantic City, a gift of $1,500 was made to the Arnold Arboretum in appreciation of the services to American horticulture of the arboretum and Prof. C. S. Sargent in their introductions of hardy plant material from all over the world.

The fourth fellowship to be awarded by the Canadian Society of Technical Agriculturists for professional distinction was conferred at its recent annual convention at Guelph, Ontario, on W. T. Macoun, Dominion horticulturist since 1910.

The Pasteur Institute in Paris has instituted a section of soil bacteriology with S. Winogradsky, formerly director of the Institute of Experimental Medicine in Petrograd, in charge.

An invitation from the Canadian Government to hold the next World's Poultry Congress at Ottawa in 1927 has been accepted.

EXPERIMENT STATION RECORD.

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RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The chemists' yearbook, 1924, edited by F. W. ATACK and L. WHINYATES (*Manchester, Eng.: Sherratt & Hughes; New York: Chem. Catalog Co., Inc., 1924, [2.] Amer. ed., pp. [7]+1147+[16], figs. 26*).—This is the second American edition of the yearbook previously noted (E. S. R., 49, p. 202).

Life without oxygen, W. M. CLARK (*Jour. Wash. Acad. Sci., 14 (1924), No. 6, pp. 123–138, figs. 3*).—A presidential address delivered before the Chemical Society of Washington on January 11, 1924.

Federal and State laws relating to the manufacture and sale of food, drugs, insecticides, etc. (*Washington, D. C.: Standard Remedies Pub. Co., Inc., 1924, pp. 883*).—This is a compilation of the Federal and State laws enacted up to January 1, 1924, relating to the manufacture and sale of foods, drugs, insecticides, narcotics, and various pharmaceutical products, etc.; Federal and State prohibition laws; State trade-mark laws; various miscellaneous laws; and the proprietary or patent medicine act, the customs tariff act, and the opium and narcotic act of Canada. A complete index adds to the usefulness of the volume.

The corrosion of aluminum cooking utensils, C. K. TINKLER and H. MASTERS (*Analyst, 49 (1924), No. 574, pp. 30–32*).—The dark stain so often produced in aluminum cooking utensils when tap water is boiled in them is attributed to the presence in the aluminum of impurities, chiefly iron. The alkali in the water has a solvent action on the aluminum but not on the iron, which is consequently left as a black stain. When a dilute acid is boiled in the utensil the iron is dissolved and the utensil again becomes bright. The removal of the dark stain by strong alkalis is attributed to mechanical action. The aluminum, on dissolving, carries along with it undissolved particles of iron.

The vegetable proteins, T. B. OSBORNE (*London and New York: Longmans, Green & Co., 1924, 2 ed., rev., pp. XIII+154, figs. 13*).—Among the important additions in this revision of the monograph previously noted (E. S. R., 22, p. 509) are chapters on the chemical individuality of protein preparations; the relation of proteins to acids and bases (contributed by L. J. Henderson); the proteins of green plants; the nutritive value of the vegetable proteins (see p. 557); and a section on the rate of hydrolysis of proteins in the chapter on products of hydrolysis of vegetable proteins.

The present status of lignin chemistry [trans. title], R. RIEFENSTAHL (*Ztschr. Angew. Chem., 37 (1924), No. 13, pp. 169–177*).—A review and discussion of recent investigations, with 178 literature references.

The lupin: Its importance in agriculture, chemical composition, and uses [trans. title], A. Guillaume (*Bul. Sci. Pharmacol., 31 (1924), No. 3, pp. 146–155*).—A review of the literature on the subject.

The present status of insulin [trans. title], H. Simonnet (*Bul. Soc. Chim. Biol., 6 (1924), No. 1, pp. 44–112, figs. 8*).—The literature on insulin is reviewed under the following topics: Isolation of the active principle of the secretion, physical and chemical properties, biochemical effects, pharmacological assay, and mode of action.

The amount of available insulin in the pancreas of domestic animals, F. Fenger and R. S. Wilson (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 83–90*).—Data are reported on the relative yields and activity of insulin obtained from the pancreas of cattle, hogs, and sheep. The averages of three determinations each were as follows: Cattle 610, hog 865, and sheep 925 mg. per kilogram of fresh pancreas. Corresponding amounts of insulin per kilogram of body weight required to produce convulsions and coma in rabbits were 0.33, 0.5, and 0.5 mg., respectively. These figures correspond to 1,785, 1,730, and 1,838 rabbit units per kilogram of fresh gland.

The most important factors in insulin production are considered to be the use of absolutely fresh glands, which should not be chilled, and the use of an efficient grinding process, which should follow directly upon the mincing.

Improvements in the preparation of insulin.—Alkaline extraction of pancreas, H. W. Dudley and W. W. Starling (*Biochem. Jour., 18 (1924), No. 1, pp. 147–150*).—The original process of preparing insulin by alcoholic extraction of pancreas has been modified by adding sodium bicarbonate to the mixture of alcohol and pancreas. This is said to result in a yield of insulin nearly five times that by the original method. The technique of the process is described, together with an improved technique for the purification of crude insulin by precipitation with picric acid and subsequent conversion of the picrate into a soluble hydrochlorid, as previously suggested (E. S. R., 49, p. 803).

The purification of insulin and similar substances by sorption on charcoal and subsequent recovery, P. J. Moloney and D. M. Findlay (*Jour. Phys. Chem., 28 (1924), No. 4, pp. 402–406*).—This paper consists of a discussion of possible methods of recovering adsorbed substances from charcoal, with a view to their isolation and purification, and an application of the principles discussed to the purification of insulin.

The method found most applicable in the case of insulin depends upon the principle of replacing the adsorbed substance (insulin) by another which is more readily adsorbed (benzoic acid). The technique is as follows: Ten liters of a partially purified solution of insulin are adjusted to an H-ion concentration of pH 2.5 with hydrochloric acid and allowed to stand over night with 400 gm. of charcoal, with occasional stirring. The charcoal is then removed, washed with water, and stirred with 2 liters of a 5 per cent solution of acetic acid in 60 per cent alcohol. After filtration, the charcoal is digested for several hours at room temperature with 3.5 liters of a 12 per cent solution of benzoic acid in 60 per cent alcohol. From the resulting solution the insulin is recovered by evaporating off the alcohol, removing excess benzoic acid by ether, and finally evaporating the ether remaining dissolved in the insulin solution.

Alterations in the ion content of the blood as the result of insulin [trans. title], H. Staub, F. Gunther, and R. Fröhlich (*Klin. Wchnschr., 2 (1923), No. 52, pp. 2337, 2338*).—Data are reported on the blood sugar, CO_2-binding capacity of the plasma, pH value of the serum, and content of inorganic phosphorus, sodium, potassium, magnesium, and calcium in the whole blood of a normal dog before the injection of insulin and in the hypoglycemic state following insulin. Similar data are reported on the blood of a diabetic subject in the state of coma and of the same subject following the injection of insulin.

In the former case the injection of insulin was followed by a lowering of the blood sugar, a slight increase in the CO_2-binding capacity, no appreciable change in pH value, a decrease in the inorganic phosphorus and calcium, a slight increase in sodium, and practically no change in potassium and magnesium. In the human subject there was a marked lowering in the blood sugar, an increase in the CO_2-binding capacity of the plasma, a slight increase in the pH value, a decrease in the inorganic phosphorus, and an increase in sodium, potassium, magnesium, and calcium.

The antiscorbutic fraction of lemon juice, I, S. S. Zilva (*Biochem. Jour., 18 (1924), No. 1, pp. 182–185*).—A further concentration of the fraction of lemon juice containing the antiscorbutic vitamin has been effected by subjecting the decitrated juice to fermentation with yeast in the presence of carbon dioxid. This destroys the sugar present without altering the antiscorbutic properties. By deducting from the total solids of lemon juice the organic acids and the sugar, both of which have been shown to have no connection with antiscorbutic properties, the active fraction is found to contain less than half of the dry matter of the decitrated juice. This residual active fraction has a nitrogen content varying from 0.004 to 0.014 per cent. It is said to give negative biuret, sulphur, and tryptophan tests and a faint murexid reaction. Precipitates are obtained with mercuric sulphate, basic lead acetate, Millon's reagent, and occasionally but not invariably with phosphotungstic acid. The solution reduces ammoniacal silver nitrate and gives a marked Pauli reaction.

The reaction proposed by Jendrassik (1923) for detecting vitamin B and its relation to the phenol function [trans. title], N. Bezssonoff (*Bul. Soc. Chim. Biol., 6 (1924), No. 1, pp. 35–39*).—It is pointed out that the color test considered by Jendrassik to be specific for vitamin B (E. S. R., 50, p. 506) is given by ortho- and para-phenols.

Solubility, J. H. Hildebrand (*New York: Chem. Catalog Co., Inc., 1924, pp. 206, figs. 40*).—The first 10 chapters of this monograph are devoted chiefly to the presentation of "a comprehensive theory of solubility," and the remaining 9 chapters to the application of this theory to existing data.

Lunge-Berl chemical-technical methods of analysis, III, edited by E. Berl (*Lunge-Berl Chemisch-technische Untersuchungsmethoden. Berlin: Julius Springer, 7. ed., rev. and enl., 1923, vol. 3, pp. XXXI+1362+27, figs. 230*).—This is the third volume of the seventh edition of this work, the first two volumes of which have been noted previously (E. S. R., 49, p. 110).

Chemical analyses with membrane filters.—IV, A study of the membrane filter itself and its applicability in analytical chemistry [trans. title], G. and J. Jander (*Ztschr. Analyt. Chem., 63 (1923), No. 8, pp. 273–291, figs. 3*).—In continuation of the series of papers previously noted (E. S. R., 47, p. 712), the report is given of a systematic study of possible errors arising in the use of membrane filters in analytical work through the action of the reagents on the organic and inorganic constituents of the filter membrane, the absorption of the reagents from solution by the filter, and the absorption on the surface of the membrane of finely divided precipitates.

Of the solutions tested, all of the neutral salts, nearly all of the acids with the exception of concentrated (4 N) nitric and sulphuric acids, and weakly alkaline salts with the exception of ammonium sulphid were without effect upon the organic matter in the membrane, as shown by the rapidity of filtration. Strong acids and bases increased the time of filtration, as did likewise alcohol mixtures containing more than from 15 to 20 per cent of alcohol by volume.

Traces of inorganic material in the membrane offered no difficulties, provided the membrane was given a preliminary treatment with N HCl, followed by washing with warm distilled water.

In regard to the absorption of the reagents by the membrane, bases were not absorbed to any appreciable extent nor were the various salts tested. Acids were absorbed to a slight extent, but any errors resulting from this were overcome by discarding the first portion of the filtrate.

The kind of membrane employed was found to have a decided effect upon the absorption of small amounts of precipitates. A smooth membrane did not absorb such precipitates, but there was appreciable absorption by porous membranes.

Experimental studies on palladium electrodes, J. C. ANDREWS (*Jour. Biol. Chem., 59 (1924), No. 2, pp. 479–494*).—A critical study of the preparation and mechanism of palladium electrodes as compared with platinum is reported, with the following conclusions:

"Palladium electrodes for H-ion determinations are much less reliable than platinum electrodes because of the lack of permanence of the former, which results from a more or less rapid change of amorphous to crystalline palladium. This change is positively catalyzed by high H-ion concentrations, the mechanism being probably an electronic exchange facilitated by the higher solution tension of amorphous palladium. The use of palladium electrodes in connection with solutions of high pH gave very erratic results."

The determination of hydrogen ions, W. M. CLARK (*Baltimore: Williams & Wilkins Co., 1922, 2. ed., pp. 480, pls. 2, figs. 41*).—The subject matter of the first edition of this volume (E. S. R., 45, p. 11) has been considerably enlarged, and over 900 new references have been added to the bibliography.

The determination of hydrogen ions in the gastric contents, J. F. McCLENDON (*Jour. Biol. Chem., 59 (1924), No. 2, pp. 437–442, fig. 1*).—A colorimetric method of determining the H-ion concentration of gastric contents is described, in which the percentage dissociation of quinaldine red in the sample being tested is determined in a colorimeter and the pH calculated by means of the chart described in a previous publication.[1]

The analysis of proteins.—II, The action of nitrous acid upon the hexone bases, R. H. A. PLIMMER (*Biochem. Jour., 18 (1924), No. 1, pp. 105–109*).—Continuing the investigation previously noted (E. S. R., 35, p. 415), the author has studied the time required to complete the reaction of lysin, histidin, and arginin with nitrous acid by the Van Slyke method.

At temperatures of from 14 to 17° C. the amino nitrogen of histidin and arginin is given off in from 15 to 20 minutes, while that of lysin requires one hour for complete reaction. In estimating a mixture of the three hexone bases a reaction time of one hour at temperatures of from 14 to 17° is recommended.

A method of estimating the tryptophan content of caseinogen, based on determinations of the nitrogen values of the mercuric sulphate precipitate, H. ONSLOW (*Biochem. Jour., 18 (1924), No. 1, pp. 63–84, figs. 2*).—The method is based upon the theoretical assumption that the total nitrogen of the mercury precipitate, obtained as described in a previous paper (E. S. R., 46, p. 112), may be considered to be made up of tryptophan N+histidin N+

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[1] Jour. Biol. Chem., 54 (1922), No. 3, pp. 647–653.

monamino N+peptid N. Based on this assumption, the tryptophan N may be calculated from the following equation:

Tryptophan N=2 [nonamino N−(2/3 histidin N+peptid nonamino N)].

The nonamino nitrogen is calculated from the difference between the total nitrogen obtained by the Kjeldahl method and the amino nitrogen obtained by the Van Slyke method. The histidin nitrogen is estimated by the method of Koessler and Hanke, and the peptid nonamino nitrogen is found from the difference between the amino nitrogen before and after complete hydrolysis.

The technique of the method is described in detail, and data are reported on the determination of tryptophan in a sample of English casein and of Merck's casein. Four determinations on the former gave the following percentages of tryptophan in 100 gm. of dry caseinogen corrected for ash: 1.92, 1.97, 1.97, and 1.87 per cent. Duplicate analyses of Merck's casein gave figures of 2.15 and 2.14 per cent.

In conclusion, a number of sources of error are discussed.

The biochemical characterization of galactose in a mixture containing galactose and arabinose [trans. title], M. Bridel and J. Charpentier (*Bul. Soc. Chim. Biol., 6 (1924), No. 1, pp. 26–34*).—The method described is an application of a previously noted method of determining glucose in alcohol solution by the formation of a crystalline glucosid with emulsin (E. S. R., 44, p. 713).

In the case of galactose, ethyl alcohol is used in place of methyl, and it is necessary to conduct the reaction for a much longer period of time, this being determined by observations from time to time of the loss in reducing power of the solution. To eliminate arabinose, as is necessary when the determination is made on gum arabic or pectin solutions, hydrocyanic acid in the presence of ammonia is added at the completion of the reaction and the liquid defecated by basic lead acetate.

Note on the effect of sodium trichloracetate on the reduction of copper solutions by glucose, D. Stiven (*Biochem. Jour., 18 (1924), No. 1, pp. 19–21*).—The author reports that if trichloracetic acid is used as a protein precipitant prior to glucose estimations by the copper reduction method, low results are obtained. This is considered to be due to the formation of an unstable copper compound of trichloracetic acid in which the copper is nonreducible.

Glycerin as a disturbing factor in the test for methanol in ethanol, C. H. LaWall (*Amer. Jour. Pharm., 96 (1924), No. 3, pp. 226, 227*).—It has been found that in the recently described test for methyl alcohol in ethyl alcohol (E. S. R., 50, p. 804) 1 part of glycerol in 500 gives a reaction equal in intensity to 1 per cent of methyl alcohol in ethyl alcohol, and that a distinctly positive reaction is obtained with a dilution of 1 in 2,000. In order to avoid misleading positive results it is recommended that liquids which contain any residue upon evaporation be distilled before applying the test. The distillation should be conducted carefully and stopped before the residue in the distilling flask becomes too concentrated, in order to prevent carrying over glycerin with the last portions of the distillate.

The quantitative determination of nitrates in soil, D. J. R. van Wijk (*Soil Sci., 17 (1924), No. 2, pp. 163–179*).—The literature on methods of determining nitrates in soil and of extracting soil for the determination is reviewed, a comparison is reported of the aluminum reduction method and the Ulsch method, and a detailed discussion is given of the development of a modification of the aluminum reduction method similar in principle to, but differing in certain details from, the method described by Burgess (E. S. R., 31, p. 206).

On account of the low content of ammonia in the soils tested, 100-gm. samples were used in place of 50-gm. samples, as recommended by Burgess. The amount of CaO was also doubled. Mechanical shaking was used in place of hand stirring, with an arbitrary time of 90 minutes before and 30 minutes after the addition of CaO. The aluminum used was cut from thin aluminum sheet, and consisted of three strips ⅛ cm. wide and 15 cm. long curled in the form of spirals, the three strips together weighing about 1.5 gm. Erlenmeyer flasks were used in place of test tubes. As a trap to prevent the escape of ammonia, a Soxhlet sugar tube with narrow constriction was used. This was fitted tightly into the neck of the Erlenmeyer flask, the tube being packed with glass wool over which N/10 HCl was poured just before the reduction. The color was determined in a Schreiner colorimeter. The technique of the modified method is given, and data are reported on its use.

A list of 39 references to the literature is appended.

The action of rennet and of heat on milk, N. C. Wright (*Biochem. Jour., 18* (*1924*), *No. 1, pp. 245–251*).—The author has applied the racemization method of Woodman[3] to caseinogen and casein with the object of determining whether the two proteins are identical. Identical racemization curves were obtained. This is considered to support the theory that "rennet does not cause any proteolytic cleavage of the caseinogen molecule, but that coagulation is due to an alteration in the colloid state of the caseinogen by which precipitation in the presence of bivalent metal ions is facilitated."

The racemization curves were also obtained for caseinogen precipitated from unheated milk, milk pasteurized at 60° C. for half an hour, milk boiled under a reflux condenser for half an hour, and milk autoclaved at 120° for half an hour. Again the curves were identical, showing that within the limits of temperature studied heat does not affect the constitution of the caseinogen molecule.

Remade milk, O. L. Evenson (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 12* (*1923*), *pp. 354–371, fig. 1*).—A brief summary is given of the results of various studies on the physical and chemical properties of remade milk. A list is appended of 17 references to the literature, most of which have been noted previously.

Report of committee on remade milk, C. S. Leete (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 12* (*1923*), *pp. 165–170*).—Essentially noted above.

Detection of goat's milk in cow's milk [trans. title], A. Heiduschka and R. Beyrich (*Milchw. Zentbl., 52* (*1923*), *Nos. 4, pp. 37–40; 5, pp. 49–52*).—The Austen test (E. S. R., 48, p. 111) with slight modifications is said to make possible the detection of 1 per cent of goat's milk in cow's milk. The modified test is conducted as follows:

Twenty cc. of the milk, with 2 cc. of ammonium hydroxid (specific gravity 0.91) is heated in a water bath at from 50 to 55° C. for 1 hour, with frequent shaking during the first half hour. The tube is then centrifuged for 10 minutes at from 1,200 to 1,400 r. p. m., replaced in the bath for 20 minutes, and centrifuged for 10 minutes. As in the original test, the milk must first be skimmed.

A new colorimetric method for the determination of urea with urease, K. Yakagi (*Jour. Amer. Med. Assoc., 82* (*1924*), *No. 15, pp. 1169–1171, fig. 1*).—The method described, which was developed originally by Nakasima and Maruoka and has hitherto been reported only in Japanese, is based upon the purple-red color given by urea in the presence of hydrochloric acid and furfural, the test being made more delicate by the addition of stannous chlorid. The color obtained is matched against a series of standards with known content of urea. Data are reported on a comparison of the method with the urease method of Van Slyke and Cullen and other methods.

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[3] Biochem. Jour., 15 (1921), No. 2, pp. 187–201.

Estimation of sugar in the blood, R. V. Stanford and A. H. M. Wheatley (*Biochem. Jour., 18 (1924), No. 1, pp. 22–28, fig. 1*).—Certain sources of error in the Folin-Wu method of determining blood sugar, as ordinarily conducted, are pointed out, and attention is called to a fallacy in the results reported by Calvert in his modification of the method (E. S. R., 49, p. 408).

It is first shown that the blue coloration obtained by the action of phosphomolybdic acid on cuprous oxid in acid solution fades with time, and that the colorimetric measurements must, therefore, be made within an hour from the time at which the blue color is produced. It is also shown that the temperature of the reaction must be the same for the standard and the unknown. To accomplish this the authors follow the practice of immersing the tubes, which are of the constricted type recommended by Folin, in a beaker of water at room temperature for 3½ minutes after removal from the boiling water bath before the Folin reagent is added. It is noted that the time required for cooling will depend upon the size of the tube, and must be determined for the particular tubes used.

The error in the results reported by Calvert is shown to be due to too low a concentration of the alkaline copper tartrate.

The application of the iodometric method to the analysis of sugar products, C. L. Hinton and T. Macara (*Analyst, 49 (1924), No. 574, pp. 2–24*).—Experimental conditions under which the most accurate results can be obtained in the iodometric determination of sugars in alkaline solutions have been studied, and with the standard technique developed from these findings the iodin values have been determined for various sugars.

The standard procedure adopted consisted in adding to 50 cc. of a solution containing about 0.08 gm. of dextrose or its equivalent 40 cc. of N/20 iodin solution and 5 cc. of N/2 sodium hydroxid solution, allowing the mixture to stand for 10 minutes at 17.5° C., acidifying it with 5 cc. of 2 N sulphuric acid, and titrating immediately the excess iodin with N/20 thiosulphate solution. Under these conditions the iodin values obtained were dextrose 1.41, lactose hydrate 0.705, sucrose 0.003, levulose (in large amount) 0.0065, and levulose in the presence of equal amounts of dextrose 0.012 gm. iodin per 1 gm. sugar.

Data are also reported showing that sucrose can be estimated by iodin titration before and after inversion, with an accuracy of about 0.2 per cent if the inversion is carried out at a temperature not exceeding 60°. Under these conditions the iodin value for sucrose is 0.744. In the absence of lactose and maltose invert sugar can be determined in many products by a single titration with iodin, using an iodin value of 0.71.

Tests with weaker alkalis, such as sodium carbonate and borax, showed that a much longer time of reaction or higher temperature is required, and that these are, therefore, less suitable for use than sodium hydroxid.

The crystallization of cane sugar, I, II, J. A. Kucharenko (*La. Planter, 71 (1923), Nos. 11, pp. 211–213; 12, pp. 231, 232*).—This is a summary of a series of papers by the author, in collaboration with W. A. Plotnikow, W. N. Tschirwinski, B. J. Bukreef, and M. I. Nachmanowitsch, published in the Reports for the Sugar Industriy (Ukraine) on the following subjects connected with a general investigation of the theoretical aspects of cane sugar crystallization:

(1) *Study of the conditions under which crystal formation takes place.*—In this study the authors were able to prepare supersaturated solutions of sucrose

which would not crystallize without inoculation from the outside. This is thought to cast doubts on the theory of spontaneous crystallization.

(2) *The relation between the weight and the surface of sucrose crystals.*—An equation is developed for the determination of the surface of a sugar crystal if its weight is known. This is $S=kP^{2/3}$, S being the surface in square centimeters and P the weight in grams. From measurements of the weight and surface of several large crystals of sugar, the value of k was found to be 4.12 ± 0.01. The surface of a sugar can thus be determined if its weight is known.

(3) *Results of experiments in which the speed of crystallization of sucrose was studied.*—In this study the following definition was adopted: "The speed of crystallization, under given conditions of supersaturation, purity, and temperature of the mother sirup, is the number of milligrams of substances deposited in the unit of time (minute) upon the unit of surface (square meter) of the growing crystal."

Data are reported showing that, with other conditions remaining constant, a heavier crystal grows relatively less and absolutely more than a lighter crystal, the speed of crystallization increases with the degree of supersaturation of the mother sirup and with rising temperature of the mother sirup, and the speed of crystallization of a given crystal does not vary while the crystal continues to grow. The relation between the speed of crystallization and the supersaturation of the mother sirup takes the form of a parabolic curve.

The preservation of food by sterilization, C. M. DUGDALE (*Jour. Soc. Chem. Indus., 43 (1924), No. 5, pp. 17T–23T, fig. 1*).—This paper deals particularly with the resistance of bacteria to heat and the rate of heat penetration in foodstuffs. In addition to a general discussion of these topics, based upon the work of other investigators, data are reported on the cultural characteristics of a group of spore-forming aerobic organisms isolated from various foodstuffs.

The most important of the characteristics noted were the almost complete absence of fermentation on carbohydrate media and a definite though varying proteolytic action of all the members of the group. Tests of the heat resistance of the most resistant of the organisms examined were made on 16-hour, 24-hour, and 10- to 14-day-old cultures, using different temperatures and times. At 100° C. the maximum heat resistance for a 16-hour culture was 55 minutes, of a 24-hour culture 90 minutes, and of 10-to 14-day cultures from 3 to 6 hours. At higher temperatures the following resistances were noted: Five minutes at 115°, 20 minutes at 108°, 35 minutes at 107°, and 45 minutes at 105°.

Black discoloration in canned corn (*Natl. Canners Assoc., Research Lab. Circ. 9–L (1924), pp. 8*).—This summarizes a previous report on the same subject (E. S. R., 47, p. 164), and supplements it by results obtained later which show that the formation of black may be prevented by coating the interior of the cans with a special enamel in which zinc oxid is suspended.

Special enamel for corn cans.—A preliminary statement, G. S. BOHART (*Natl. Canners Assoc. Circ. 10–L (1924), pp. [5]*).—Directions are given for the preparation of several enamels for lining cans to be used for corn, as suggested above.

Time-tables for home canning of fruits and vegetables (*U. S. Dept. Agr., Misc. Circ. 24 (1924), pp. 4*).—This circular contains general directions for canning fruits and vegetables, time tables for canning fruits and tomatoes in the water-bath canner at 212° F. and nonacid vegetables in the pressure canner, with the method of treatment before processing in every case; directions for making thin, medium, and thick sirups; and a concise summary of the various steps in canning.

It is recommended that the pressure canner be used for everything except fruits and tomatoes. Canning is not recommended for such vegetables as root crops, mature lima beans, pumpkin, and squash.

The extraction of oil from seeds, nuts, and kernels, J. Brewis (*Jour. Soc. Chem. Indus., 43 (1924), No. 5, pp. 111–119, figs. 8*).—This is a discussion of the processes involved in the commercial extraction of seed oils by pressure and by the use of solvents.

The technical industry of synthetic perfumes, R. Sornet (*La Technique Industrielle Parfums Synthétiques. Paris: Gauthier-Villars & Co., 1923, pp. XI+135*).—This is a compilation of industrial methods for the preparation of synthetic perfumes.

METEOROLOGY.

Long-range weather forecasting: Predicting weather by the year in place of by the day, H. J. Browne (*Sci. Amer., 131 (1924), No. 2, pp. 82, 83, figs. 8*).—The author maintains that "long range weather forecasting, a year or more in advance, is based on correct interpretation of the effect of solar heat on oceanic surface temperatures. The sun's heat is measured in terms of the solar constant. Resultant changes in oceanic surface temperatures affect the temperature, speed, and volume of the warm ocean currents, which in turn similarly influence the cold countercurrents and, together, the situs, extent, and temperatures of the cold water areas, particularly of the Temperate and subtropical zones west of continental bodies. In turn, the locations, extent, and pressures of the subpermanent oceanic meteorological highs and lows are governed and affected, with their resultant winds, and in general the temperature gradients between the oceans and the continents. Hence the landward flow, volume, and extent of oceanic moisture laden winds are governed and can be quantitatively measured. Studied in conjunction with the polar high pressure areas, the oceanic subpermanent highs and lows can be used to forecast the frequency, intensity, and courses of the cyclonic lows and anticyclonic highs which work to restore the equilibrium of tropical heat and polar cold and of surface and upper airs. . . .

"The writer is already on record elsewhere as having forecasted the year 1924 as on the whole a cold, dry year in the United States, wet in the southeast and extreme northwest, moist in the usually dry range country and the plateaus, and drought-stricken in the country east of the Mississippi and north of the Ohio and Potomac, as well as in central and southern California. It may now be stated that every comparable area in the world has had recently, is having, or will have this year, similar weather." It is predicted that "the year 1925 will be a severe one generally throughout the world, and that 1926–1927 may witness a return of 1816, the 'year without a summer.'"

Tables for counting out the evaporation of the soil under all climates, L. Običan (*Boka-Belgrade, Yugoslavia: [Author], 1922, pp. [3], table, pls. 2*).—A table based on "20 years' experimental work of the writer in Europe, America, and Africa" is given, which shows the evaporation from the soil as determined by the relative humidity and temperature of the air, the author maintaining that it is upon these two factors that evaporation from the soil mostly depends.

The relation between precipitation and yield in Lower Bavaria [trans. title], F. Baur (*Met. Ztschr. [Brunswick], 41 (1924), No. 6, pp. 170–173*).—Correlations are reported of yields of winter and spring wheat, winter and spring rye, oats, and potatoes, with the rainfall of each month of the year at five stations in a region in which the average annual rainfall is 600 to 800 liters per square meter (23.6 to 31.5 in.), of which 320 to 440 liters fall during the period from April to August, inclusive; the average annual temperature is 7 to 8° C. (44.6 to 46.4° F.), the average temperature for the five months April to August being 13 to 14°; and heavy soils predominate, although medium and lighter soils occur widely. Considering the correlations individually as well as collectively, the author concludes that (1) for winter and spring rye and wheat a dry early spring, especially a dry March, is advantageous, (2), for wheat harvested after rye (winter wheat at the end of July and spring wheat early in August) dry weather in July is advantageous, (3) a dry June is beneficial for potatoes but harmful for oats, a wet January is good for oats but harmful for potatoes, and (4) a wet January is good for winter wheat. For other regions and other climatic conditions there would naturally be other relations between rainfall and yield.

The climate of the Netherlands Indies, IV [trans. title], C. Braak (*K. Magnet. en Met. Observ. Batavia, Verhandel., 8 (1923), pt. 4, pp. III+223-278+91-122, pls. 11, figs. 6*).—This is part 4 of volume 1 of a proposed 3-volume treatise on this subject, in the Dutch language with English summaries, and deals with clouds and sunshine. Parts 1 to 3 have been noted (E. S. R., 50, p. 416).

Causes of cloud formation are discussed, and cloud forms are described (with excellent illustrations). Vertical and regional contrasts in cloudiness and types of clouds, mists, monthly, regional, and altitude distribution of sunshine, and variations in light intensity are also reported upon. The sunshine shows wide variations with elevation, time of day and year, and geographical position. "The percentage of sunshine is smallest in the proper cloud zone and increases, as a rule, higher up in the mountains, as well as at lower levels, and also at greater distance from the mountains."

It is pointed out that the intensity of radiation of the tropical sun is often overestimated, and it is shown that the solar radiation at Batavia with the sun at an altitude of 65° is comparable with that at Washington with the sun at an altitude of 40°. "Above the lowlands the influence of haziness is larger than that of vapor content. As humidity and rainfall undergo similar changes and rainfall sweeps away the haziness, the fluctuations of the monthly pyrheliometrical values at Batavia are mainly parallel to those of the monthly rainfall on Java, high radiation coinciding with high rainfall. The reverse is the case on the high summits . . ., the radiation being there lower in the wet than in the dry season."

SOILS—FERTILIZERS.

The farmer's raw materials: Air, water, soil, and manure, J. Hendrick (*Edinburgh: W. Green & Son, Ltd., 1923, pp. XV+211, figs. 6*).—This is one of the Scottish Series of Junior Agricultural Textbooks. It deals specifically with air, water, soil, and manure as so-called raw materials for use in the production of crops. It contains chapters on the air; water; the formation of the soil; the composition of the soil; some soil properties; the microorganisms of the soil; soil fertility and manuring; the valuation of manures; barnyard manure and other organic manures; nitrogenous, phosphatic, and potash manures; and lime and liming.

Soils for farmers, H. Puchner (*Bodenkunde für Landwirte. Stuttgart: Ferdinand Enke, 1923, pp. XVI+710, pls. 5, figs. 212*).—This is a practical and semitechnical discussion of soils as a medium for the growth of agricultural crops and as structural and technical material, with particular reference to the agricultural requirements of continental Europe. It contains chapters on soil formation, soil mixtures and their special behavior, mobility and variation of soil mixtures, behavior of the soil, division and investigation of soils, and soil utilization.

The chemistry of the earth's crust, H. S. WASHINGTON (*Smithsn. Inst. Ann. Rpt. 1920, pp. 269–319, figs. 6*).—A detailed discussion of the chemistry of the earth's crust is presented, including information much of which may be of interest in the study of soil fertility.

The stratigraphic study of peat deposits, A. P. DACHNOWSKI (*Soil Sci., 17 (1924), No. 2, pp. 107–133, figs. 20*).—In a contribution from the U. S. D. A. Bureau of Plant Industry field methods for the study of peat deposits are described, with particular reference to their differentiation into series and type profiles. Some of the results obtained from studies of peat deposits by this method are presented.

Miscellaneous soil samples—their value, R. E. NEIDIG and G. R. MCDOLE (*Idaho Sta. Circ. 33 (1924), pp. 3*).—The limitations of chemical analysis of miscellaneous soil samples are discussed.

Soil survey of the Winslow area, Arizona, A. T. STRAHORN ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+155–188, pls. 4, fig. 1, map 1*).—This survey, made in cooperation with the Arizona Land Department, deals with the soils of an area of 147,840 acres in northeastern Arizona, lying in the southern portion of the Colorado Plateau. The area includes the flood plains of the Little Colorado River and Cottonwood Wash, extensive areas of moderately sloping plains, moderately rolling ridges, and areas of rough and broken terraces and mesas.

The soils of the area have been derived almost entirely from the erosion and disintegration of sedimentary rocks. Igneous rock formations have contributed very little material to the soils of the area. The soils are classified as residual, old valley filling, and recent alluvial soils. Including rough broken land, riverwash, and dunesand, 17 soil types of 7 series are mapped, of which rough broken land and Navajo clay cover 28.2 and 10.5 per cent of the area, respectively.

Grundy County soils, R. S. SMITH, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 26 (1924), pp. [2]+66, pls. 2, figs. 6*).—This survey deals with soils of an area of 273,625 acres lying principally in the early Wisconsin glaciation in northeastern Illinois. The topography is in general gently undulating. Owing to the fact that artificial drainage has been provided, the county is said to be as a whole fairly well drained. The soils are grouped as upland prairie, upland timber, terrace, swamp and bottom land, and residual soils. Of these the brown silt loam and black clay loam upland prairie soils and the brown sandy loam terrace soils cover 39.36, 22.24, and 11.57 per cent of the area, respectively.

Analyses and data from field experiments are presented relating to the fertility requirements and crop adaptations of the prevailing soil types. An appendix containing explanations for interpreting the soil survey and general information on the principles of soil fertility is included.

Soil survey of Dallas County, Texas, W. T. CARTER, JR., ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+1213–1254, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Texas Experiment Station, deals with the soils of an area of 569,600 acres in northeastern Texas. The topography is predominantly gently rolling, and the drainage is good in all sections except in the larger stream bottoms and on some level higher terrace lands. The county lies within the Black Prairie region of Texas.

The soils of the county are grouped broadly into uplands proper, which represent materials derived from the underlying strata, and the water-laid soils.

occurring as recent deposits in overflowed bottoms and as old deposits upon terraces. Including chalk and gravel pits, 21 soil types of 13 series are mapped, of which the Houston black clay and clay, the Trinity clay, and Bell clay cover 24.5, 16.2, 15.3, and 11.4 per cent of the area, respectively.

On some physical properties of Transvaal soils, B. de C. Marchand (*Jour. Agr. Sci. [England], 14 (1924), No. 2, pp. 151–169, figs. 5*).—Studies conducted at the Department of Agriculture, Pretoria, are reported, in which an endeavor was made to correlate certain physical properties of soils with their texture with a view to an interpretation of the mechanical analysis. The method proposed by Keen and Raczkowski for the determination of pore space, water capacity, apparent and true specific gravities, and volume of expansion of soils was used.

It was found that certain of these properties can be roughly correlated with the clay content of the soil, but that the relationship is not sufficiently exact to be of much practical value. Marked differences were found in the properties of certain soils of similar clay content but of different origin and appearance. It appeared that comparison of all soils without discrimination on the basis of mechanical make-up would lead to utterly erroneous conclusions. The value of mechanical analysis is thought to lie chiefly in its relation to genetic classification. This seems to be particularly true in a country like the Transvaal, where the bulk of the soil is sedentary and large expanses of alluvial soil are unknown.

Notes on some littoral and other soils, B. C. Aston (*New Zeal. Jour. Agr., 27 (1923), No. 5, pp. 298–302*).—Chemical and mechanical analyses of several samples of littoral and other soils from New Zealand are presented and briefly discussed.

Stanley Brook soils, T. Rigg (*Nelson, New Zeal.: Cawthron Inst., 1923, pp. 4*).—Mechanical and chemical analyses of soils from the Stanley Brook area of New Zealand are presented and discussed.

Westport and Karamea soils, T. Rigg (*Nelson, New Zeal.: Cawthron Inst., 1923, pp. 9*).—Mechanical and chemical analyses of typical samples of soils from the Westport and Karamea districts of New Zealand are presented and discussed, with particular reference to fertility requirements.

Improvement of mechanical condition of soils and sub-soils, H. A. Mullett and P. R. Scott (*Jour. Dept. Agr. Victoria, 21 (1923), No. 10, pp. 583–597, figs. 2*).—Studies on the improvement of the mechanical condition of soils and subsoils, with particular reference to the use of gypsum, are presented.

The results of experiments on soils subject to water-logging in winter showed that gypsum increased the yield 69 per cent in one case and 160 per cent in another. The increases were not above 20 per cent on soils which did not water-log. Investigations made on samples taken with a soil augur from treated and untreated field soils showed that the colloids in a clay subsoil were substantially reduced, in some cases as much as 40 per cent. This reduction is attributed to flocculation and precipitation of the colloids in suspension. This is taken to indicate that the pore space of the soil is freed of gelatinous clay substances by gypsum, and the permeability to water is thus improved.

Progress report concerning reclamation of salt patch at Berri State Experimental Orchard, A. J. Perkins (*So. Aust. Dept. Agr. Bul. 174 (1923), pp. 20, pls. 3, figs. 4*).—This is a progress report of an attempt made to reclaim four or five acres of orchard land in South Australia rendered sterile from the rise of salt subsequent to the application of irrigation. The areas are situated on a moderate hill slope. The mean salt concentration in two barren portions of the sterile soil was found to be 1,059 and 234 parts per 100,000. Common salt seemed to be the chief constituent, although black alkali was present abundantly in some spots. Leaching operations through a drainage system removed 9,020 lbs. of soluble salts per acre, the chief constituents removed being common salt, sodium sulphate, and sodium carbonate.

The beneficial effect to plant growth of the temporary depletion of some of the essential elements in the soil, W. F. GERICKE (*Science, 59 (1924), No. 1527, pp. 321–324*).—Studies conducted at the University of California are briefly reported which showed that the temporary depletion of certain available nutritive elements in the soil by plants is one of the most important agencies and conditions of nature essential for large crop production. The crop-producing power of soils for barley and similarly responding plants was found to be determined in a very large measure by the rate and the state of the temporary depletion of some of the essential elements in physiologically available form from a high level by the growing plant. The soil where this phenomenon was greatest was generally the most highly productive.

Remarks and observations on imbibitional soil moisture, E. A. FISHER (*Jour. Agr. Sci. [England], 14 (1924), No. 2, pp. 204–220, figs. 2*).—In a contribution from the department of textile industries of the University of Leeds, it is pointed out that water in soils is held as capillary or interstitial water present as wedges between the soil grains, and as imbibitional water which is associated in some way other than interstitially with the clay particles and with the colloidal coating of the soil grains. Imbibitional water is the cause of the swelling of soil and other colloidal systems in water.

The nature of the imbibitional process is discussed, and it is suggested that with clay, wool, and soil imbibition may be due to the attainment of a Donnan equilibrium as is the case with gelatin. It is pointed out in particular that such swollen colloids appear to behave as perfectly elastic solids when under compression. This is not the case with sand and water nor with soil, wool, or cotton in xylol when no swelling occurs.

It is further suggested that imbibition may be a factor in the movement of soil water in addition to capillarity, and it is shown that such a factor is quite consistent with the general mathematical treatment of the movement of soil water as developed by Gardner and others.

On the moisture relationships in an ideal soil, B. A. KEEN (*Jour. Agr. Sci. [England], 14 (1924), No. 2, pp. 170–177, figs. 4*).—In a contribution from the Rothamsted Experimental Station, an analytical discussion is presented in connection with studies by others on the movement of water in soil and the manner in which water is distributed over the particles and within the interstices, the purpose being to bring out erroneous features of this work. It is concluded that a system of spheres in closest packing is not suitable as a basis for the development of theories on the dynamical and statical aspects of moisture distribution in soil. Suggestions are made as to how this matter should be approached.

Soil acidity—its nature, measurement, and relation to plant distribution, E. T. WHERRY (*Smithsn. Inst. Ann. Rpt. 1920, pp. 247–268, pls. 2*).—This paper consists of abstracts of essays relating to soil acidity, a field method for measuring soil acidity using colorimetric determination, and the relation of soil acidity to plant distribution. Studies of plant groups are described, and special problems of plant distribution are briefly discussed from the standpoint of soil acidity. It has been found, for instance, that the vegetation areas of southern New Jersey differ distinctly in the acidity of their soils. This, it is thought, may account for the peculiarities of the flora of the Pine-Barren area.

The calcium content of soil in relation to absolute reaction, C. O. Swanson, P. L. Gainey, and W. L. Latshaw (*Soil Sci., 17 (1924), No. 3, pp. 181–191*).—Studies conducted at the Kansas Experiment Station are reported, in which a large number of soils obtained from the vicinity of Manhattan and also from various counties in the State and from different experiment stations of the United States were analyzed for calcium soluble in cold normal hydrochloric acid. A close correlation was found to exist between the calcium content and the pH value of soils of similar physical texture collected under similar climatic conditions.

Adsorption and absorption of bases by soils, C. P. Jones (*Soil Sci., 17 (1924), No. 3, pp. 255–273, fig. 1*).—Studies conducted at the Massachusetts Experiment Station are reported which showed that colloids present in soils may be conveniently divided into inorganic and organic colloids. The forms commonly comprising the class of inorganic colloids are silicic acid and the silicates, aluminum hydoxid and its compounds with silicic acid, and iron hydroxid. The different kinds included in the organic class of colloids are the humic compounds and the various kinds of microorganisms, like the soil bacteria and fungi, and the mucinous substances which are secreted by such organisms.

Colloids are capable of showing adsorption and absorption. Adsorption is believed to be very small, whereas absorption is quite large, depending upon the chemical nature of the reactive colloids. The absorption of bases by soils is directly dependent upon the degree of hydrolysis of the salt in solution. The laws governing hydrolysis therefore would apply to absorption. The absorption of bases of compounds containing a highly ionized base and acid is small. A decrease in the ionization of both base and acid results in an increase in the degree of hydrolysis and consequently an increase in base absorption. The absorption of the base of substances which have a small solubility product is in accordance with Wenzel's law that the reactive velocity of solids with liquids is proportional to the area of contact.

It is concluded that the absorption of bases by a soil is due to chemical reactions between soil constituents and the dissolved salts. Adsorption or surface attraction of colloids is only an accessory.

Easily soluble calcium of the soil in relation to acidity and returns from liming, F. L. Duley (*Soil Sci., 17 (1924), No. 3, pp. 213–228*).—Studies conducted at the University of Wisconsin on the relation between the easily soluble calcium in soil and the returns obtained from the use of lime in the field are reported. Comparisons were made with the results of ordinary acidity determinations made on the soil solution obtained by the displacement method.

In nearly all cases liming increased the amount of calcium in the displaced soil solution. The calcium content of the soil solution was reduced from 22 to 54 per cent by the presence of a clover crop on Colby silt loam soil. Soils kept in the greenhouse showed great variation in the calcium content of the displaced solution as compared with field samples taken in the spring. The calcium in the soil solution was greatly increased in the strongly acid Colby silt loam when kept under greenhouse conditions for a period of six months. There was a rapid increase in the calcium content of the solution from soils allowed to stand in the greenhouse after the crop was removed.

No definite correlation was established between the calcium in the soil solution and the need for lime in the field. A comparison of soils which gave good returns for lime in the field with soils from which the returns from liming were medium to poor showed that the average acidity was about the same according to the Truog test. However, the calcium soluble in 0.04 N carbonated water averaged only 553 lbs. per acre on the soils giving marked increases for lime and 810 lbs. per acre on soils giving small returns for lime. It was further noted that marked increases due to liming were mainly on infertile soils.

These results are taken to indicate that if a soil is well supplied with nitrogen, phosphorus, and a fair amount of calcium soluble in carbonated water, it will probably produce good yields of the common field crops in spite of a considerable amount of acidity.

It was found that soils of approximately the same acidity may vary widely in their content of calcium soluble in carbonated water. Soils showing strong acidity varied in soluble calcium content from 494 to 880 lbs. per acre, those of medium acidity from 510 to 1,030 lbs., those of slight acidity from 566 to 2,920 lbs., and those of very slight acidity from 500 to 2,870 lbs. per acre. The return per ton of limestone showed a closer relation in different soils to the amount of calcium soluble in 0.04 N carbonated water than to the degree of acidity. Carbonated water extracted on the average 9.32 per cent of the total calcium in the soil studied.

Soil reaction in relation to calcium adsorption, C. O. SWANSON (*Jour. Agr Research [U. S.], 26 (1923), No. 3, pp. 83–123, figs. 7*).—This is a complete reference to the article incompletely noted (E. S. R., 50, p. 512).

The electrical conductivity of extracts from soils of various types, and its use in detecting infertility, W. R. G. ATKINS (*Jour. Agr. Sci. [England], 14 (1924), No. 2, pp. 198–203, fig. 1*).—Studies conducted at the Marine Biological Laboratory, Plymouth, are reported which showed that the electrical conductivity of aqueous extracts of soils in the proportion of 1 of soil to 5 of water varied according to the time of extraction. In the more fertile soils extraction for from 3 to 4 hours yielded a solution of less than half as great a conductivity as of one obtained by extraction for from 4 to 11 days. The maximum conductivity value was reached in a peat extract almost at once, being very high. The maximum value was also reached quickly in certain infertile soils, which gave an extract of very low conductivity similar to that of the purest upland streams.

A high electrical conductivity in the extract may only indicate the presence of an excess of salts and does not necessarily indicate a good soil. However, the results are taken to indicate that a rapid increase in conductivity as extraction is prolonged indicates increased solubility, partly through bacterial action, and may be considered as a useful indication of fertility. On the other hand, a low conductivity, which remains low on continued extraction, denotes a soil so insoluble as to be infertile.

Effect of ignition at various temperatures upon certain physical properties of soils, G. J. BOUYOUCOS (*Soil Sci., 17 (1924), No. 2, pp. 135–139*).—Studies conducted at the Michigan Experiment Station on the effect of heating soils at various temperatures upon the degree of change that takes place in them and the temperature at which the change commences and ends are reported. The studies were based upon heat of wetting, unfree water, and plasticity as indicators of changes caused by heating.

It was found that all three of these properties began to be affected at about the same initial temperature, which is about 230° C. (446° F.). At the temperature of 485° all three properties were greatly reduced, but they were not entirely destroyed. They were entirely destroyed and completely disappeared at a temperature of 800°. Even ashes of peats and mucks gave no heat of wetting at this temperature, even though they were exceedingly fine. These results are considered to suggest strongly the possibility of evolving a method of determining or estimating the collodial content or condition of soils and their degree of activation.

The effect of aeration upon the development of barley in a heavy clay soil, R. V. ALLISON (*Soil Sci., 17 (1924), No. 2, pp. 97–105, figs. 4*).—Studies conducted at the New Jersey Experiment Stations are reported, in which the effects of aeration and a constant flow of nutritive solution through the soil were determined on the growth of barley.

The results demonstrated the value of a sufficient supply of available oxygen in the soil to the respiratory processes of plants. The response of barley to aeration in this heavy soil was decidedly positive. Although a constant flow of nutritive solution through the soil effected a considerable increase in growth, these results are taken to indicate that any increase of compactness or imperviousness of the soil may be considered as injurious to plant growth through the consequent decrease in the supply of available oxygen. The method used in the study of aeration is described in detail.

Nitrates and nitrification in field soils, R. N. GOWDA (*Soil Sci., 17 (1924), No. 4, pp. 333–342, fig. 1*).—Studies conducted at the Iowa Experiment Station on the effect of seasonal conditions, moisture content, and various fertilizer treatments on the nitrate content and nitrifying power of Webster silty clay loam soil are reported.

In all the soils examined there was a large accumulation of nitrate in June with a gradual decrease in July, followed by rapid decrease in August and September to a minimum. There was a slight increase in nitrates in October. The optimum moisture content for nitrification in this soil was about 18 per cent. The application of manure up to 12 tons per acre caused the greatest increase in nitrate accumulation and nitrifying power. The application of 20 tons per acre effected the greatest increase in crop yield, followed in order by the 16-, 12-, and 8-ton applications. Crop residues turned under the previous fall increased the nitrate content and nitrifying power of soil when lime was present, and increased the crop yield about 6.5 per cent.

Rock phosphate caused a greater accumulation of nitrates in this soil than either acid phosphate or commercial fertilizers, and when used with crop residues it produced about as large an increase in crop yield as did acid phosphate. Acid phosphate on the other hand increased the nitrifying power of the soil more than rock phosphate. Complete commercial fertilizers used with crop residues did not produce any greater increase in crop yield than did the crop residues alone. Crop yield on this soil had a direct relation to the nitrate content and nitrifying power of the soil.

Nitrification experiments on soils of the red prairies, H. F. MURPHY (*Jour. Amer. Soc. Agron., 16 (1924), No. 2, pp. 130–136*).—Studies conducted at the Oklahoma Experiment Station on nitrification in Vernon very fine sandy loam and Kirkland loam soils are reported.

The results showed that lime either in the form of ground limestone or calcium oxid increased nitrification in both of the soils studied. For the three months, June, July, and August, nitrification was highest during July in both soils. The heavier rate of application of lime gave the greatest nitrification in both soils. Calcium oxid was somewhat more effective than ground limestone in increasing nitrification. Manure did not cause a further increase in nitrification when added with heavy applications of lime, but did increase nitrification when added with lighter applications of lime on the Kirkland soil.

Microbes and soil fertility, E. KAYSER (*Microbes et Fertilité du Sol. Paris: Payot, 1923, pp. 160*).—This is one of the La Renaissance Agricole series, directed by P. Gervais. It consists of two parts.

The first part deals with the different bacteriological phenomena which occur in the decomposition of farm manures and fertilizers and in the transformation of soil organic matter. The second part deals particularly with soil fatigue, methods used in soil hygiene, and the practical utilization of the properties of microorganisms in soil processes and in water purification. Information on the intervention of bacteria in the transformation of some agricultural products and on the conservation of agricultural products is appended.

Soil bacterial types and green manuring, I. L. Baldwin and A. J. Smith (*Ind. Acad. Sci. Proc., 38 (1922), pp. 253–255*).—Experiments conducted at Purdue University to determine the influence of green manuring on the biological activities of limed and unlimed soils showed that calcium carbonate treatments exerted no appreciable influence on the bacterial types in a black sandy loam soil containing a rather high percentage of organic matter. The application of green manure in the form of young rye plants at the rate of 12 tons per acre caused considerable disturbance in the equilibrium existing between the various bacterial types. The rod forms increased from 42 per cent of the total to 62 per cent, largely at the expense of the coccus forms. The spore formers decreased from 40 to 32 per cent and the gelatin liquefiers increased from 78 to 86 per cent.

A study of the factors operative in the value of green manure, P. E. Lander, B. H. Wilsdon, and M. Mukand Lal (*Agr. Research Inst., Pusa, Bul. 149 (1923), pp. [2]+23, pls. 2*).—The results of five years' studies in the laboratory and field on the comparative value of artificial manures, leguminous green crops, and nonleguminous green crops as fertilizers are reported. No regular rotation was followed, wheat following wheat.

The results as a whole showed that the response to green manuring was much greater in sandy soils than in stiff soils. The increase in yield was much greater in sandy soils receiving green manure than in those receiving quantities of artificial manure equivalent to those developed by the green manure. The main factor responsible for the increase in yield was found to be the improvement in the physical texture of the soil due to the addition of green manure. When the above-ground portion of a leguminous crop was removed, the yield was diminished to a remarkable degree. Nonleguminous green manuring was found to be as effective as leguminous manuring. It is concluded that the application of green manure carted from elsewhere is a profitable procedure.

Action of soil solutions on root development [trans. title], F. Terlikowski (*Rocz. Nauk Rolnicz., 9 (1923), No. 3, pp. 544–560*).—Studies on the influence of solutions of different fertilizer salts alone and in different combinations and in varying concentrations on the length of the roots of wheat sprouts are reported. Combinations of plant nutrients were used corresponding as nearly as possible to soil solutions of different concentrations. Calcium and magnesium sulphate and potassium and magnesium chlorid were the salts used in pure solution.

In general the solutions of the pure salts restricted root growth, the calcium sulphate having the least effect when used in a saturated solution. Calcium chlorid had a somewhat stronger action. Magnesium sulphate and chlorid completely inhibited root growth in certain concentrations, and in general these salts had a greater action in this respect than the other two salts.

On the other hand, solutions of kainit and Kaluss potash strongly stimulated root growth. A combination of sodium nitrate and sodium phosphate when used with potash salt increased root growth, but when used with kainit and in a low concentration it had no influence upon root growth.

Nitrogen survey.—Part II, General review of the nitrogen situation in the United States, H. A. Curtis (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 226 (1924), pp. II+63, figs. 7*).—In a second contribution to the subject (E. S. R., 51, p. 22), an attempt is made to relate the items of Chilean nitrate cost and supply with the balance of the items involved, and so to present in outline a complete picture of the nitrogen situation as it exists in the United States to-day. Emphasis is thrown on the agricultural phase of the nitrogen problem, although the military phase is also considered. Special attention is devoted to nitrogen fixation processes, with particular reference to the Government activities of that nature.

American agriculture and nitrogen fixation, H. A. Curtis (*Chem. and Metall. Engin., 30 (1924), No. 18, pp. 703–706, figs. 3*).—An estimate is given of the fixed nitrogen balance sheet in America. It is concluded that, considered broadly, three developments necessary before cheap fertilizer can be made available to the farmer are (1) the perfection and expansion of the air nitrogen industry to a point where it can produce cheap nitrogen, (2) production of a cheap phosphoric acid or its equivalent to replace acid phosphate, and (3) elimination of all low grade plant nutrient materials from the fertilizer industry.

Is ammonium nitrate an explosive? R. Aufschläger, trans. by H. Schlatter (*Ztschr. Gesam. Schiess u. Sprengstoffw., 18 (1923), No. 11–12, pp. 117–120; trans. in Chem. and Metall. Engin., 30 (1924), No. 16, pp. 619–621*).—The results of different studies on the explosibility of ammonium nitrate are summarized, in which a velocity of detonation of about 2,500 meters per second was observed. This is taken to indicate the character of ammonium nitrate as a destructive explosive. Ammonium nitrate is insensitive and difficult to detonate and can not be classed with practical blasting explosives, since it propagates detonation only under certain conditions such as its existence in large masses, large diameter, or in strong confinement. On the other hand, even unconfined ammonium nitrate can be detonated with certainty, although with greater difficulty than when confined, provided the initial impulse is sufficiently strong. Since this is true not only for specially prepared ammonium nitrate but also for the raw, somewhat moist technical product, blasting must not be resorted to in order to loosen caked heaps of this material, as this could easily result in the explosion of the entire mass.

Phosphate rock in 1922, G. R. Mansfield (*U. S. Geol. Survey, Min. Resources U. S., 1922, pt. 2, pp. 109–132*).—Data on the production, consumption, imports, and exports of phosphate rock in the United States and in certain foreign countries during 1922 are reported, together with data on recent methods of treatment of raw phosphates to render the phosphoric acid content soluble. It is stated that the sales of phosphate rock in the United States in 1922 increased 17 per cent in quantity over 1921 but decreased 15 per cent in value.

The utilization of indigenous phosphates in India, C. M. Hutchinson (*Agr. Jour. India, 19 (1924), No. 1, pp. 4–14*).—The production of available phosphate by the composting of indigenous rock phosphates with manure and sulphur is briefly outlined to show the possibility of such a procedure in providing available phosphoric acid for use in India.

Gypsum in 1922, K. W. Cottrell (*U. S. Geol. Survey, Min. Resources U. S., 1922, pt. 2, pp. 133–139*).—Data on the production, use, imports, and exports of gypsum during 1922 are reported. It is stated that the quantity of gypsum mined in the United States in 1922 was 3,779,949 short tons, or an increase of 31 per cent over the output in 1921. Of the total quantity sold crude, 13 per cent was sold as agricultural gypsum.

Investigations upon the fertilising effects of carbon dioxide, L. B. TIMMIS (*Expt. and Research Sta., Cheshunt, Herts., Ann. Rpt., 8 (1922), pp. 57–66, figs. 4*).—In the first part of this report studies on the carbon dioxid content of the atmosphere in cucumber houses under normal working conditions are reported, indicating that a marked reduction of the concentration of carbon dioxid takes place in the atmosphere of a cucumber house exposed to bright sunlight for three hours when the house remains closed. In the second part experiments are reported on supplying carbon dioxid to a glass house of 1,000 cu. ft. capacity.

Annual report of the chemical laboratory for fertilizers [trans. title], R. V. MAYO (*Puerto Rico Dept. Agr. y Trab., Informe An. Lab. Quim. Abonos, Rio Piedras, 1922–23, pp. 11*).—Guaranties and actual analyses of 236 samples of fertilizers and fertilizer materials collected for official inspection in Porto Rico during the fiscal year 1922–23 are presented and discussed. Of the total number of samples analyzed, 7.62 per cent were deficient either in nitrogen or phosphoric acid. No potash deficiencies were noted.

AGRICULTURAL BOTANY.

The rôle of plant physiology in agriculture, G. L. C. HOWARD (*Agr. Jour. India, 18 (1923), No. 3, pp. 204–218, figs. 3*).—This address dealt with the effect of changes in the environmental conditions on the nature and quality of the produce, interpretation of field experiments, incidence of disease and the physiological state of the plant, and acclimatization and change of seed.

Notes on the physiology of the sweet potato, W. A. GARDNER (*Abs. in Phytopathology, 12 (1922), No. 5, p. 251*).—A review is given of the literature of work on sweet potatoes, with special reference to transformations of carbohydrates.

Internal structure and mode of development of bacteria, A. KIRCHENSTEINS (*Structure Intérieure et Mode de Développement des Bactéries. Riga, 1922, pp. 90, pls. 7, figs. 20*).—From the studies here indicated the following conclusions were drawn:

The granular formations which may be distinguished in the bacterial plasma are said to be integral parts of the bacterial structure. They are of nuclear character, distinguishable morphologically from the plasma and giving rise to forms which may be designated as nuclear granules or bacterial nuclei.

The metachromatic granulations and other so-called bacterial granules should be considered as nuclear granules. In young bacteria nuclear material may be distributed and diffused throughout the bacterial plasma.

The multiplication of bacteria may occur through a mitosis which under certain conditions much resembles the division by mitosis, or it may occur by mitosis followed by the simultaneous division of the nucleus and the nuclear material. Bacterial division by mitosis suggests the like division in animal cells and in those of higher plants. It is claimed that bacteria possess a structure analogous to that of animals and higher plants.

The structure and function of the endodermis in the leaves of the Abietineae, I. SOAR (*New Phytol., 21 (1922), No. 5, pp. 269–292, figs. 12*).—This work on the endodermis in the Abietineae was undertaken to ascertain, as far as possible, the structure and distribution of the endodermal cells. The facts observed suggest that the peculiar structure of the endodermis in the leaves of these gymnosperms is one of the factors which serve to retard transpiration.

The following reagents were found to be most useful for determining the constituents of the cell wall in the endodermis, as by their use distinction could be made between suberin, lignocellulose, and cellulose, namely, iodin and sulphuric acid, concentrated sulphuric acid, dilute sulphuric acid, phloroglucin and hydrochloric acid, eau de Javelle, alcoholic solution of Sudan III, alcoholic solution of alkannin, fresh strong alcoholic solution of chlorophyll, aqueous solution of caustic potash, and Schultze's solution.

"The endodermis in the leaves of certain of the Abietineae has been shown to conform to a general plan, suberization occurring always on the radial walls which are pitted, and on the transverse walls which are unpitted. The suberin is always deposited as a layer on each side of the lignocellulose core. The structure of the tangential walls varies in the different species described. They are often both lignified and suberized, but sometimes they, especially the inner tangential walls, consist of cellulose. Where these walls are suberized pits or breaks in the suberized membrane are present. In young leaves of *Pinus sylvestris* the development of the endodermal walls proceeds as follows: (1) Cellulose, (2) lignocellulose, (3) lignocellulose with a surface layer of suberin. Thickening develops first in the radial walls. When the endodermal sheath is incomplete additional protective tissues are often found. Thus the growing leaf base of Pinus is protected by sclerotic scales, and the basal region of the leaf in Picea and Abies by additional layers of lignified hypoderma. The suberization and lignification of the radial walls render the endodermis relatively impervious to the passage of water through the walls alone. Thus the transpiration current must flow largely through the endodermal cell, and it is probable that the protoplasm exerts some control over the rate of flow."

Effect of different rates of transpiration on the dry weight and ash content of the tobacco plant, N. B. MENDIOLA (*Philippine Jour. Sci., 20 (1922), No. 6, pp. 639–655*).—"The results of the present experiments show that in tobacco plants grown in water culture there was no absolute correlation between the percentage of ash, the relative rates of transpiration, and the total dry matter."

Foliar transpiring power of the coconut, S. F. TRELEASE (*Philippine Jour. Sci., 20 (1922), No. 2, pp. 167–177, fig. 1*).—"The purpose of this article is to describe the results of tests on the daily march of transpiring power of coconut (*Cocos nucifera*) leaves, as indicated by standardized cobalt-chlorid paper. . . .

"Inspection of the graph of foliar transpiring power . . . shows that this has its maximum value at 6 a. m., a short time after sunrise. Approximately the maximum was maintained until 11 a. m. Then the index of transpiring power decreased rather gradually and uniformly until 8 p. m., and then decreased rapidly to a low night value. This low night index was maintained approximately constant until 2 a. m. From 2 to 4 a. m. there was a slight increase in the index of transpiring power, and from 4 to 6 a. m. there was a rapid increase to approximately the maximum value. The graph of the daily march of transpiring power of coconut thus resembles in a general way the published graphs showing transpiring power for other kinds of plants studied by the same method. . . .

"The present tests were made upon only the lower surfaces of the leaves, because the stomata of coconut are limited to the lower surface; and preliminary tests showed that the transpiring power of the upper surface is extremely low, almost zero. . . .

"It should be emphasized that this paper deals with fluctuations in transpiring power, not in transpiration. . . .

"It should be mentioned, in connection with a consideration of the results of these tests, that the best-known methods for studying transpiring power may be expected to give somewhat different results when used on a plant such as coconut, in which the exposure of the leaf surfaces undergoes diurnal alterations. Only one of these methods (the one depending upon the power of the leaf surface to give off water vapor to a standard water-absorbing surface) was used in the present experiments."

On the relation between permeability variation and plant movements, B. Sen (*Roy. Soc. [London], Proc., Ser. B, 94 (1923), No. B 660, pp. 216–231, figs. 2*).—"A new method of measurement of electric resistance of a living tissue, alike intact and isolated, has been described in which the natural potential difference between the parts of the tissue and its fluctuations have been overcome. The tissue is joined in series with a sensitive galvanometer, whose deflection gives the intensity of the current, the potential difference between the parts of the tissue being the only source of e. m. f. employed, and whose value is determined for each observation by means of a compound potentiometer. From the deflections of the galvanometer and the readings of the compound potentiometer, the variations of resistance of any heterogeneous system could be accurately determined.

"Using electric resistance of a plant tissue as the measure of the number of free ions outside protoplasmic membrane of the cells, it has been shown that in a stimulated tissue the number of ions increases in a marked degree due to the increase of permeability of the protoplasmic membrane. This has been found to be true, both in the case of the motile pulvinus of *Mimosa pudica* and the stems and petioles of *Helianthus annuus*, Bryophyllum, and Raphanus. The amplitude of the mechanical response of the leaf of Mimosa closely corresponds to the diminution of resistance of the pulvinus. It has been shown that the observed effects are physiological, and no such variation of resistance takes place in a dead or killed tissue."

A method for inducing protoplasmic streaming, W. Seifriz (*New Phytol., 21 (1922), No. 2, pp. 107–112*).—While studying the reaction of protoplasm to various reagents, the author observed an extraordinary amount of streaming, often at a very high rate, in the cells of Elodea which had been treated in certain of these reagents, specifically methyl alcohol; saponin and the similar glucosids, smilacin and senegin; strontium chlorid and barium chlorid; and copper. One or two of the unusual types of streaming here described may occasionally be observed in untreated cells.

Three possible partial explanations mentioned as to the cause of this stimulation and of its production by such diverse substances are a reduction in viscosity, a decrease in surface tension, and an alteration in electrical charge. These are briefly discussed. That three of the four substances which arouse streaming are possessed of electrical properties suggests that the stimulation is an electrical phenomenon. However, the hypotheses offered are admittedly purely speculative.

The dia-heliotropic attitude of leaves as determined by transmitted nervous excitation, J. C. Bose and S. C. Guha (*Roy. Soc. [London], Proc., Ser. B, 93 (1922), No. B 651, pp. 153–178, figs. 12*).—The authors claim to have succeeded, after many years of investigation, in discovering the fundamental reaction to which the directive movement is due in case of leaves which adjust themselves to incident light. The particular attitude assumed by the leaves is said to be brought about in certain cases by transmitted nervous impulse impinging on the motor organ, which is not simple but highly complex in *Mimosa pudica* and *Helianthus annuus*, the examples here employed as typical.

The nervous tissue was located by means of the electric probe, which was made to pass by successive steps through the petiole. The maximum transmitted excitation was localized at the phloem portion of the fibrovascular bundle. Hence the phloem functions, it is claimed, as the nerve of the plant. Excitation is propagated along a definite conducting channel, which is traced from the receptive area in the lamina to the corresponding effector in the motor region. In the petiole of Mimosa, provided with two subpetioles carrying rows of leaflets, stimulation of the right row of leaflets by light gives rise to an excitatory impulse which reaches the right effector and induces a right-handed torsion. Stimulation of the left row induces the opposite or left-handed torsion. When both the subpetioles are illuminated equilibrium is possible only in case the entire leaf surface (consisting of the two rows of leaflets) is perpendicular to the incident light. The diaheliotropic attitude of leaves is thus brought about by distinct nervous impulses initiated at the perceptive region actuating the different effectors.

In Mimosa with four subpetioles, illumination of the second subpetiole induces an upward movement; that of the third subpetiole a downward movement. The leaf is thus adjusted in space by the coordinated action of four reflexes. Results similar to these were also obtained with Helianthus.

Though for the movement of the eye, for example, the contraction of the muscle opposing the movement has to be inhibited, in the torsional movement of the leaf it is found that the stimulation of one nerve causes in a contiguous nerve an opposite reaction. The nervous impulses of opposite signs reaching different flanks of the motile organ is thus of importance in the coordination of the resulting movement.

Theory of geotropism based on mass action, J. Loeb (*Jour. Gen. Physiol., 5 (1923), No. 6, pp. 853–863, figs. 8*).—"In order to test the idea that geotropic curvature is a function of chemical mass action, it is necessary to find out, first, whether the mass of material sent by a leaf into a stem increases with the mass of the leaf, and second, whether the geotropic curvature of a stem suspended horizontally increases also with the mass of the leaf. . . .

"It is shown that the rate of geotropic curvature of a piece of stem of *Bryophyllum calycinum* when suspended horizontally increases with the mass of an apical leaf attached to the stem. It is shown that the dry weight of the stem increases with the mass of the leaf attached, and also that the degree of curvature increases with this increase in the dry weight of the stem. The conclusion is drawn that geotropic curvature is in this case a function of mass action of the material sent by the leaf into the basal part of the stem. The material sent by a leaf into the apical part of a stem does not lead to the same geotropic curvature."

The colouring matter of red roses, G. Currey (*Roy. Soc. [London], Proc., Ser. B, 93 (1922), No. B 651, pp. 194–197*).—An examination of the petals of the red rose George Dickson has shown that the anthocyan pigment contained therein is the cyanidin glucosid, cyanin, which is present to the extent of about 9 or 10 per cent by weight of the dried petals, and that this exists in the petals as an oxonium salt. A little of a yellow glucosid also occurs in the same flowers, but it has not been identified. Further work may show it to be a glucosid of quercetin, corroborating the work of Everest (E. S. R., 40, p. 819) on the purple-black Viola, in which it was shown that an anthocyan (violanin) and the flavonol glucosid from which it could be produced by reduction (a glucosid of myricetin), are present, side by side, in the same flowers. This would be additional evidence in favor of the hypothesis that anthocyans are produced, in nature, by the reduction of the flavonols. It is noted that this Australian rose contains the same coloring matter as was isolated by Willstätter and Nolan (E. S. R., 34, pp. 709, 710) from the rose *Rosa gallica*, grown in Europe, this fact showing how widely these coloring matters are distributed in nature.

The rose George Dickson was chosen for this investigation on account of its deep red color, which would indicate a fairly large percentage of the anthocyan pigment. For the isolation of this pigment the methods used by Willstätter and Nolan were adopted, while the examination of the flavonol pigment was carried out on somewhat similar lines to that used by Everest in his examination of the Viola. Isolation of the anthocyan pigment was accomplished, and on comparing the properties of the pigment with those given by Willstätter and Nolan for cyanin chlorid, they were found to be identical. The anthocyan pigment of the red rose George Dickson is, therefore, the di-glucosid cyanin.

Hydrolysis of the cyanin chlorid was carried out with a small quantity of the glucosid pigment, and the sugar-free pigment separated in small needles having a metallic luster. These are said to possess the same properties as described by Willstätter and Everest for cyanin chlorid. From examination of the small quantity of yellow sap pigment available it appears possible that this is a quercetin glucosid. This may be myrticolorin, a rhammoglucosid of quercetin, similar to that isolated from eucalyptus leaves. Although it is the property of the flavonols to undergo oxidation on exposure to air in alkaline solution, the very rapid oxygen absorption of the solution previously mentioned would appear to be due to some other cause, possibly to the presence of tannin matter. An examination of the petals showed that both pyrogallol and catechol tannins were present, the former (probably gallotannin) being present in the greater quantity.

The significance of silicic acid in plant nutrition [trans. title], L. and E. HILTNER and M. KRONBERGER (*Prakt. Bl. Bayer. Landesanst. Pflanzenbau u. Schutz, 1 (1923), Nos. 2, pp. 24–27; 3, pp. 36–39; 5, pp. 55–59, fig 1*).—A brief account of this work sets forth the conclusion that silicic acid (combined) is not the equivalent of other substances, as phosphoric acid, but that it makes possible increased and improved assimilation.

The relation of climatic conditions to the salt-proportion requirements of plants in solution cultures, S. F. TRELEASE and B. E. LIVINGSTON (*Science, 59 (1924), No. 1520, pp. 168–172*).—A preliminary account is given of experiments which are said to show the influence of climatic factors on the growth of plants in nutrient solutions. Wheat plants were grown in eight different solutions, the plants of one series being maintained under ordinary greenhouse conditions, while those in the other series were grown under constant temperature in a basement, the illumination being entirely by electric light. The experiments were repeated at short intervals, and the dry weight of the tops of each plant was determined.

Differences and agreements in the results are discussed, and the authors conclude that it is not safe to attempt to determine, with any considerable degree of precision, the comparative physiological values of different salt solutions without being able to describe adequately the climatic conditions under which the tests were made.

Studies in phaenology, No. 3, 1921, F. DARWIN (*New Phytol., 21 (1922), No. 1, pp. 34–40*).—In continuation of reports previously made (E. S. R., 46, p. 434), it is stated that the most obvious character of the dates of flowering in 1921 was their remarkable earliness. This feature corresponds to dryness (low rainfall) and heat (high temperature range), in which characters 1921 surpassed 1918, the year showing the earliest flowering dates previous to 1921. The connection of low rainfall with early flowering is supposedly to be ascribed partly to the quicker warming up of the drier soil in the spring, so that early growth would be promoted through the higher soil temperature provided sufficient water is present for the needs of growth.

The number of plants herein placed on record is 253, and the record covers the time from November 14, 1920, to September 16, 1921, inclusive.

Effect on banana fruit of premature appearance of the inflorescence, N. B. Mendiola (*Philippine Agr., 10 (1922), No. 6, pp. 299–301, fig. 1*).—A banana plant bent or broken by a storm a little below the point where the leaves unite to form the so-called false stem, and probably cracked at this point, showed there, on the next day, a part of the inclosed inflorescence, which was then kept under close observation, afterwards revealing abnormalities in the resulting fruit which are described. Among these were unusually short internodes between the "hands," absence of the usual stunting in the late appearing fruits, and no vacant space between the normal and the last or secondary fruits.

Note on "effect on banana fruit of premature appearance of the inflorescence," F. P. McWhorter (*Philippine Agr., 10 (1922), No. 9, p. 441*).—It is suggested as a legitimate inference that at least part of the changes noted by Mendiola in the above article may be traced directly to the light relation.

Major plant communities of North Carolina, B. W. Wells (*North Carolina Sta. Tech. Bul. 25 (1924), pp. 20, figs. 15*).—Pointing out that North Carolina possesses a widely divergent flora due to the variations in climatic conditions in the State, the author presents the results of an ecological study in which the flora of North Carolina is roughly divided into 11 major plant formations, with notes on the distribution, habitat, and physiognomy of associated species and successional relations of each.

An effective absorption apparatus, E. S. Stinson and J. W. Shive (*Science, 59 (1924), No. 1521, pp. 193, 194, fig. 1*).—A form of apparatus adapted to the qualitative and quantitative determination of the gaseous evolutions from flowers of sulphur and from ground sulphur when freely exposed to air and to bright sunlight is figured and described.

GENETICS.

Biomathematics, W. M. Feldman (*London: Charles Griffin & Co., Ltd., 1923, pp. XIX+398, figs. 125*).—This book gives the methods employed for a thorough mathematical interpretation of the results of biological investigations and includes chapters of the following titles: Simplified methods in arithmetic; a few points in algebra; a few points in elementary trigonometry; a few points in elementary mensuration; series; the simple and compound interest laws in nature; functions, variables, and constants; differentials and differential coefficients; maxima and minima; successive differentiations; integral calculus; biochemical applications of integration; thermodynamic considerations and their biological applications; use of integral calculus in animal mechanics; use of the integral calculus for determining areas, lengths, volumes, and moments of inertia; special methods of integration; Fourier's theorem; differential equations; mathematical analysis applied to the coordination of experimental results; and biometrics. An introduction is given by W. M. Bayliss.

Experimental biology and the work of the Moscow institute, N. Koltzoff (*Science, 59 (1924), No. 1536, pp. 497–502*).—This is a brief report of the investigations which have been carried on at the Institute of Experimental Biology at Moscow, much of which is of primary interest to the geneticist. Cytological investigations by P. I. Shivago have included morphological studies of chromosomes and determinations of chromosome numbers in domestic fowls as 15 pairs of autosomes with 2 X-chromosomes in the male and an X- and a Y-chromosome in the female. Coupled with this has been the determination of 40 genetic factors in the fowl by Screbrovsky, with some success in ascertaining linkages in certain of the 16 groups. Crossovers seemed to be common in both sexes and with most of the linked characters.

Color inheritance in guinea pigs and rats and the inheritance of various characters in Drosophila are also being studied. In a series of investigations on the chemical properties of the blood, four types have been distinguished in guinea pigs according to the catalase content of each, with a possible explanation of the method of inheritance. Similar conditions as to the catalase content of the blood were also found in fowls. Inheritance studies are also being made in four types of blood according to agglutination of humans, fowl, and cattle.

A special section of the institute is devoted to eugenic studies. Attention has also been given to the rejuvenation of old guinea pigs and fowls through the transplantation of gonads. The transplantation of frogs' eyes and other organs has also received attention.

Supernumerary spikelets in Mindum wheat, F. A. COFFMAN (*Jour. Heredity, 15 (1924), No. 4, pp. 186–192, figs. 4*).—Two variant plants, each bearing a single spike containing supernumerary spikelets, were discovered in Mindum durum wheat at Akron, Colo., in 1922. Seed of these variants were sown and gave rise to 28 progeny plants, which bore 51 heads, all containing supernumerary spikelets similar to those in the abnormal parental heads. In all the progeny, as in the parental heads, supernumerary spikelets were found only in the lower portion of the heads. The cause for the occurrence of this variation is unknown. Variations similar in nature have occurred in other cereals, and it is believed more logical at present to attribute the occurrence of this variant type in Mindum durum wheat to mutation rather than to natural crossing.

The transition of peritoneal epithelial cells into germ-cells in Gallus bankiva, J. B. GATENBY (*Quart. Jour. Micros. Sci. [London], n. ser., 68 (1924), No. 269, pp. 1–16, pl. 1, fig 1*).—A fowl is described in which the left ovary was atrophied and contained an adenoma. Just anterior to the ovary there were two areas of newly forming testicular tissue, which histological studies showed had been formed by peritoneal epithelium. A complete description, with illustrations, of the histological changes observed is given.

One embryo from two eggs, T. H. MORGAN (*Sci. Mo., 18 (1924), No. 4, pp. 354–371, figs. 16*).—This is a review of cases described in the literature of the development of one embryo from two eggs. The examples are mainly from the lower animal forms and from insects.

Mendelian analysis of the pure breeds of livestock.—II, The Duchess family of Shorthorns as bred by Thomas Bates, S. WRIGHT (*Jour. Heredity, 14 (1923), No. 9, pp. 405–422, figs, 13*).—The establishment of the Duchess family of Shorthorns by Bates is reviewed, and, on the basis of the author's coefficients for inbreeding and relationship (E. S. R., 51, p. 228), it is shown that he started with Colling-bred stock already 40 per cent inbred. "Whatever the basis in his own mind, he actually pursued a steady policy, maintaining a relationship of nearly 60 per cent between the animals he mated, maintaining coefficient of inbreeding of something over 40 per cent, and maintaining a relation to the foundation bull, Favourite, falling only slowly from 76 per cent to 57 per cent in eight generations."

The wisdom of such a policy of inbreeding to produce uniformity, but not such close inbreeding as to destroy the value of selection, is discussed.

An analysis of the sheep-breeding experiments of Dr. and Mrs. Alexander Graham Bell at Beinn Bhreagh, N. S., W. E. Castle (*Jour. Heredity, 15 (1924), No. 2, pp. 75–85, figs. 2*).—The author has reported a genetic analysis of the records of the sheep breeding experiments of Bell (E. S. R., 50, p. 381).

The multinippled condition was found to be hereditary, and marked progress toward the selection for increased numbers was made from an average of 2.27 nipples per lamb born in 1890 to an average of 5.38 nipples in 1914. After this time practically no improvement in the nipple number was made, because few lambs having more than 6 nipples were produced, though the ewes and rams used had more nipples than in the earlier years. Tabulations of the lambs according to the number of nipples of their sires and dams showed that there was a tendency for similarity in the nipple number of parents and offspring. In a Dorset cross with the multinipple stock, the indications were that the 2 nipple number tends to be dominant, but evidence was also secured which pointed toward the possibilities of increasing the nipple number in the offspring from such a crossbreed.

In contrast with the inheritance of the multinippled condition, twinning did not seem to be hereditary, but was apparently a product of vigor and environmental conditions. The data on color inheritance indicated that black is a simple recessive to white, though there were some exceptions to this.

The inheritance of polydactylism in man [trans. title], O. Koehler (*Biol. Zentbl., 43 (1924), No. 6, pp. 646–672, figs. 14*).—A number of families of humans having polydactylous offspring are tabulated and discussed, from which it seems to be concluded that this condition is mainly due to a recessive character, though exceptions have also been found, some of which were not inherited in this way and others of which appeared to be nonhereditary.

"Double ears" in Brahma cattle, J. L. Lush (*Jour. Heredity, 15 (1924), No. 2, pp. 93–96, figs. 2*).—The occurrence in Brahman cattle of a flat piece of cartilage projecting from the ear parallel to the main axis is described from the Texas Experiment Station. Based on the limited evidence of the breeding records obtainable, it is concluded that this character, double ears, is inherited as a simple Mendelian dominant.

The inheritance of some wool characters in Mele sheep [trans. title], T. Terho (*Ztschr. Induktive Abstam. u. Vererbungslehre, 32 (1923), No. 1, pp. 37–60, fig. 1*).—The average and variability in thickness of wool fibers and the length of the crimp waves are tabulated and discussed from the inheritance standpoint, based on these characters of 6 Border Leicester, 40 Merino, 24 F_1s between the two breeds, 22 F_2s, 79 F_1s×Merinos, and 8 F_1s×Leicesters. The thickness of the fibers was intermediate in the F_1, with only a little more variability in the F_2s, indicating that a number of factors (about 8) are responsible for the diameter of the fiber. The variability of the fiber thickness was closely correlated with the average thickness, 0.59±0.05. The fine crimp of the Merino wool seemed to be largely dominant over the coarse wool of the Leicesters, but here there was also some intermediacy and very little difference in the variability of the F_1 and F_2 populations.

Fully medulated fibers were found only in the Leicesters and partially developed in 1 F_1, 8 F_2s, and 1 F_1×Leicester. Wool characters are concluded to follow a form of blending inheritance, a relatively constant intermediate resulting from crosses.

A note on the inheritance of egg production in the Leghorn fowl, G. W. HERVEY (*Poultry Sci., 3 (1924), No. 4, pp. 134, 135, fig. 1*).—A study of the relation between the egg production of mothers and daughters in the First Vineland and First Bergen Egg Laying Contests has revealed little relationship. The mean production was about 20 eggs more for the dams, and the correlation between the dams' and daughters' production was 0.0571±0.0231.

Self-fertilization in Nicotiana, F. F. SMITH (*Science, 59 (1924), No. 1534, p. 461*).—In a previous publication[8] Morgan has stated that in self-sterile plants it has not been possible to demonstrate whether the pollen could fertilize the egg cell if it reached it. The author describes experiments which show that there is no block to self-fertilization in Nicotiana. According to suggestions of East (E. S. R., 49, p. 25) that self-sterility is due to the fact that pollen tubes after self-pollination show no action in growth, and hence fail to reach the ovary before the decay of the flower, the author pollinated flowers from the same branch of plants of *N. alata* and hybrids between *N. alata* and *N. forgetiana*, the pollinations being made simultaneously on the unopened bud and the first and second flowers. Seed were set in 68 per cent of the pollinations of unopened buds, while in the first flowers seed were set in only 16 per cent, and in the second flowers none whatever were set. This is said to indicate that the gametes are not incompatible, and that self-fertilization can take place in Nicotiana provided the male gamete can reach the egg.

A genetic view of sex expression in the flowering plants, R. A. EMERSON (*Science, 59 (1924), No. 1521, pp. 176–182*).—In an address before the American Society of Naturalists the author presented data to show that sex characters of flowering plants are to be interpreted on the basis of genetic factors associated with chromosomes just as vegetative characters are interpreted.

Contribution to the study of sex determination, E. TROTTET (*Contribution à l'Étude des Causes Déterminantes lors de la Formation des Sexes. Inaug. Thesis, Univ. Bern, 1922, pp. 40*).—After reviewing previous work on this subject, the results of several experiments with rabbits are given. First observations of the proportions of the sexes in 30 litters indicated that the two sexes were born in approximately equal numbers. The sexes in 7 litters sired by males from which the left testicle was removed and in 7 litters sired by males from which the right testicle was removed were also approximately equal.

In other experiments does were treated subcutaneously and intramuscularly with 1-cc. doses of ½ per cent solutions of adrenalin daily for 5 days preceding service, during the first 10 days of gestation, and during the first 15 days of gestation. The sexes of the offspring were again approximately equal except with the last treatment, in which case 120 males and 78 females were produced in 25 litters. Only 2 of these litters showed a greater proportion of females, whereas there were over 50 per cent males in 21 of the litters.

The author discusses the results with regard to other investigations, from which he concludes that adrenalin injections during the first 15 days of pregnancy tend to constrict the placental blood vessels, thus reducing the oxygen supply of the fetus and tending toward an increase in the number of males produced. The period during which the sex may be fixed is, however, relatively short, probably between the tenth and fifteenth day of intrauterine life, since adrenalin injections up to the tenth day of pregnancy had no effect on the proportion of the sexes produced.

The effect of pubescence, oestruation, and menopause on the voluntary activity in the albino rat, J. R. SLONAKER (*Amer. Jour. Physiol., 68 (1924),*

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[8] Nat. Acad. Sci. Proc., 9 (1923), No. 5, pp. 170, 171.

No. 2, pp. 294–315, figs. 21).—In an investigation at Stanford University, the amount of activity of female rats, as measured in a revolving cage, has been used as an indicator of the length of the sexual cycle. The daily activity was found to be rhythmic from the time of puberty until menopause, the increases in the activity occurring in conjunction with oestrum as verified by vaginal smears. The 8 rats, on which records were kept from 37 or 59 days of age to over 800 days, were confined continuously in individual revolving cages with a small stationary box just big enough to sleep in, except for a period of about 100 days at the approximate age of 300 days, when they were removed, bred, and allowed to produce a litter. Daily records of the revolutions of the drums were kept.

The young females showed increases in their activity as indicative of the first occurrence of oestrum from 63 to 109 days of age, with periodical increases at about 4-day intervals thereafter to a maximum at about 120 days of age. As the animals grow old the activity accompanying oestrum gradually decreases, and as menopause approaches the periods become less regular and the activity not as great.

In a study of 22 animals up to an average of 83.7 days of age, the occurrence of the first oestrual period was found to vary from 46 to 83 days of age. The first cycles ranged in length from 3 to 7 days, averaging 4.5 days, while the last cycles observed in this group ranged from 3 to 5 days in length, with over half of the periods of 4 days duration.

In another group of 8 rats, 225 of the 368 cycles observed from puberty to about 300 days of age were 4 days long. After removing these females from the cages for about 100 days to demonstrate their fertility, they were continued in the revolving cages through menopause, which occurred at an average of 755 days. The length of, and the activity accompanying the oestrual periods, were found to be much more irregular as menopause approached, the irregular periods running as long as 10 to 45 days, and the activity accompanying each period was progressively reduced.

In another test, the effect of changing the diet from that of a combined animal and vegetable to an entirely vegetable diet resulted in a reduction in the periodic rhythm of activity, beginning about 50 days after changing the diet. The curve of the activity closely resembled that of animals approaching menopause. When an omnivorous diet was again supplied to this group, typical oestrual changes were established within a month. The necessary handling accompanying the vaginal smear test has been found by the author to have a retarding influence on oestrum.

The activity of males measured in revolving cages was found to be variable from day to day, but no regularity seemed to be associated with this variability as in females.

The awakening of copulatory ability in the male albino rat, C. P. Stone (*Amer. Jour. Physiol., 68 (1924), No. 2, pp. 407–424, figs. 7*).—In a study at the Stanford University, the awakening of copulatory ability in the male albino rat was studied by observing the action of 56 young males toward the introduction of a sexually receptive female for three periods of from 8 to 10 minutes each evening until the copulation occurred. The male rats used were weaned at 20 days of age, weighing an average of 31.61 gm. They were well grown and were represenitive of the colony.

At the conclusion of the first copulation each male was slaughtered, the reproductive organs studied, and the presence of spermatozoa in the ductus deferentes and testes determined. The average age of initial copulation was 48.00 days, the ages ranging from 37 to 72 days. The body weights of the animals were variable at the time of initial copulation, though the earliest cases of copulation occurred in animals that were for the most part above the average weight. Nineteen of the 56 males copulated before mature spermatozoa were found in the tubules of the testes. The youngest animal having spermatozoa in the testes at the time of copulation was 40 days of age. In animals copulating below 55 days the organs of intromission were not sufficiently well developed to enable the insemination of the females. Since the awakening of copulatory ability, the maturation of spermatozoa, and the development of the organs of intromission are all necessary for sexual maturity, it is concluded that the average age at which males can inseminate females is about 65 days.

FIELD CROPS.

Handbook of breeding of agricultural plants, C. Fruwirth et al. (*Handbuch der Landwirtschaftlichen Pflanzenzüchtung. Berlin: Paul Parey, 1924, vol. 2, 5 ed., rev., pp. XVI+255, figs. 56*).—This is a revision of the volume (E. S. R., 45, p. 35) embracing The Breeding of Corn, Fodder Beets, and Other Root Crops, Oil Seed Plants, and Grasses.

[Field crops experiments in Ireland in 1923] (*[Ireland] Dept. Agr. and Tech. Instr. Jour., 23 (1924), No. 4, pp. 315–329, 365–377*).—The progress of experiments noted earlier (E. S. R., 49, p. 329; 50, p. 231) is reviewed.

The commoner grasses of Burma, with notes on their agricultural importance and distribution, A. McKerral (*Burma Dept. Agr. Bul. 20 (1923), pp. [2]+23, pls. 24*).—Grasses common in Burma are described and illustrated, with notes on distribution and economic value.

Forage crops for Oregon coast counties, A. E. Engbretson and G. R. Hyslop (*Oregon Sta. Bul. 203 (1924), pp. 32, figs. 6*).—The production and demand for forage in the Oregon coast counties is discussed, with recommendations for crops and practices based on experiments at the Astoria Substation and observations on farms. The experimental work included variety trials with peas, vetches, clovers, grasses, turnips, rutabagas, and mangels; tests of seed mixtures for pasture, hay, soiling, and silage; seeding tests with vetch and peas and oats; fertilizer and manuring tests with vetch, clover, and roots; and studies of the effect of lime on vetch and clover.

An experimental study of the variety as an agronomic unit in wheat and oats, L. J. Stadler (*Jour. Amer. Soc. Agron., 16 (1924), No. 6, pp. 366–372*).—In an experiment at the Missouri Experiment Station to determine the extent of variation in yield and other economic characters between pure and typical seed stocks within representative varieties of wheat and oats, the stocks of a single variety differed in yield considerably, well beyond the limits of experimental error. The relative range in yield was notably greater in some instances than in others, partly due to the different numbers of stocks tested. Each of 13 trials indicated too wide a range in yield to justify the use of the variety as an agronomic unit. While some of the extreme yields, both high and low, are questionable on account of competition, in each single-row test wide differences in yield may also be found which could hardly have been materially affected by competition, and the fact that competition has occurred would be in itself an evidence of rather wide agronomic differences between the stocks compared.

General varietal recommendations may frequently be in error because the stock included in the variety test does not fairly represent the variety to which the conclusions are applied. The result of the variety test may properly be applied only to the strains actually tested. All available stocks of pure line varieties may be known to belong to the same strain, but in the case of ordinary commercial varieties, not known to be pure lines, there is no reason to assume that the stocks meeting the same taxonomic descriptions are necessarily similar in yield and value.

Fall sown grain in the coastal plain of Georgia, W. J. Davis (*Georgia Coastal Plain Sta. Circ. 1 (1921), pp. 4*).—Suggestions given regarding the soils, varieties, culture, fertilizer, and seed treatment for fall seeded grain in the coastal plain area in Georgia are based on experiments already recorded (E. S. R., 48, pp. 128, 628.)

The influence of irrigation water on the composition of grains and the relationship to nutrition, J. E. Greaves and E. G. Carter (*Jour. Biol. Chem., 58 (1923), No. 2, pp. 531–541*).—At the Utah Experiment Station, the grains of wheat (E. S. R., 36, p. 234), oats (E. S. R., 41, p. 141), and barley (E. S. R., 48, p. 437) were found to decrease in nitrogen content as the irrigation water used in their production increased, whereas increases were observed in ash, phosphorus, potassium, calcium, and magnesium contents. The ratios of calcium and magnesium to phosphorus indicated that the increase in prosphorus is mainly inorganic.

Overirrigation is indicated as a factor in soil depletion by washing out the soluble nitrogen, resulting in a low protein grain, and by causing the cereals to take up larger quantities of potassium and phosphorus than ordinarily.

The influence of fertilizers on the baking quality of cereals [trans. title], M. P. Neumann (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 1, Wirtschaft.-Prakt., pp. 9–16*).—Experiments of the author showed that application of complete fertilizer did not affect adversely the baking quality of rye. Baking tests of wheat from eight differently fertilized plats showed loaves of similar quality, that from the untreated plat resembling the bread from the plat receiving complete fertilizer. The increased grain yields caused by fertilization did not appear to depreciate the quality of the grain.

Inoculation for legumes, W. A. Albrecht (*Missouri Sta. Circ. 121 (1924), pp. 12, figs. 5*).—A popular discussion of the merits of inoculation for legumes, with outlines of methods of inoculating.

Time of seeding experiment with alfalfa [trans. title], H. Witte (*Sveriges Utsädesför. Tidskr., 34 (1924), No. 1, pp. 32–39, fig. 1*).—The relation of the average yields from 1921 to 1923, inclusive, of alfalfa seeded at Svalöf in 1920 on June 18, July 5 and 15, August 2 and 18, and September 1 and 15 was 100, 97, 95, 86, 77, 58, and 7, respectively.

Experiments and breeding work with barley for upper Norrland [Sweden] [trans. title], O. V. Holmgren (*Sveriges Utsädesför. Tidskr., 34 (1924), No. 1, pp. 21–31*).—The results of cooperative tests with barley varieties carried on from 1914 to 1920 are summarized to show the relative yielding capacity and length of growing period of the different sorts. Several newly originated strains and a variety known as Bjarkökorn, from southern Norway, were compared with a variety of barley commonly grown throughout the region where the tests were in progress. Bjarkökorn showed a grain-yielding capacity equal to that of the common variety, while in straw production it stood lower; but this was offset largely by a reduction of 4 days in the growing period. Based on the average result of 67 tests made from 1914 to 1920, Vega barley yielded 11.5 per cent more grain and 2.8 per cent more straw than were secured from the commonly grown variety of the region.

Growing field beans in Montana, C. McKee (*Montana Sta. Circ. 125 (1924), pp. 8*).—The environmental, cultural, and harvesting requirements of field beans are outlined for the Montana grower.

Tifton bur clover (Medicago rigidula 0373), W. J. Davis (*Georgia Coastal Plain Sta. Circ. 2* (*1923*), *pp. 4, fig. 1*).—Experiments in cooperation with the office of Forage-Crop Investigations, U. S. D. A., and the Georgia State College of Agriculture indicate that Tifton bur clover is a very promising variety for the coastal plain region of the State. This variety grows more vigorously, has a greater resistance to extreme temperatures, seasonal conditions, and disease, and seeds much more abundantly than the other bur clovers tested. The characteristics, cultural needs, and pasture value are shown briefly.

Character and usefulness of fibers from petioles of buri palm with measurements of the tensile strength of the fibers, R. B. Espino and G. C. Zabella (*Philippine Agr. Rev.*, *16* (*1923*), *No. 4, pp. 287–297, pls. 6, fig 1*).—A microscopical study and tensile tests of the buntal fiber from the petioles of the buri palm (*Corypha elata*) are reported, with observations on its yield and economic value.

Most of the buntal fibers in the market are vascular bundles, although some of the fine fibers are purely sclerenchyma strands. The latter should be separated from the coarse vascular bundles and used as material in the manufacture of extra fine hats. Like abaca, the buntal fibers composed of relatively short elements are stronger than those with longer fiber cells. The fibers obtained from the central portion of a petiole are relatively coarse, and are weaker and apparently less valuable than finer fibers found near or along the outer epidermis of the petiole. The fiber from the fourth petiole was the strongest, with the strength decreasing gradually outward and inward to the oldest leaf and to the youngest visible petiole, respectively. It seems that the proper harvest should be the first four petioles and one petiole a month thereafter.

Botanical study of the cassava [trans. title], J. C. T. Uphof (*Rev. Agr., Com. y Trab.* [*Cuba*], *6* (*1924*), *No. 12, pp. 27–34, figs. 12*).—The characteristics and relative hydrocyanic acid content in different plant organs of four varieties of cassava grown in Cuba are set forth, together with observations on blooming and anatomy.

Experiments with castor seed conducted at Sabour, C. S. Taylor (*Agr. Research Inst., Pusa, Bul. 117* (*1921*), *pp.* [*1*]+*10*).—Among different types of castor beans obtained in Bihar, oil contents ranging from 21.8 to 58.8 per cent on the whole seed were estimated by ether extraction. Carrying "low" types and "high" types through two generations gave evidence that in most cases the plants did not transmit a high or low oil content for even one generation, but both high and low seeds gave plants which in nearly every case bore seed near the mean oil content, about 49 per cent with healthy plants. Only two types appear to have maintained their high oil content for more than one generation. Field trials gave indications that variations in agricultural treatment may possibly have more effect on the oil yield of the crop than actual chemical selection.

Boll studies with upland cotton, W. E. Bryan and E. H. Pressley (*Arizona Sta., Timely Hints for Farmers, No. 149* (*1924*), *pp. 10, figs. 5*).—Comparative boll studies showed that Acala, Mebane, Hartsville, Webber 49, and Deltatype Webber, all upland cotton varieties, began flowering within the same period, July 1 to 6, and the period of greatest flowering was coincident, July 31 to August 5. Mebane flowered more rapidly than the other varieties during the first 40 days, but ceased flowering earlier than Acala or Hartsville. The average period of boll maturity for the season was for Acala 54 days, Mebane 57, Deltatype Webber 57, and Hartsville 63 days. The period of maturity for bolls from flowers opening in September was about 20 days longer than for bolls from flowers opening in July. The percentages of shedding for the whole season averaged 65 for Acala, 75 for Mebane, 62 for Hartsville, and 61 for each of the Webber strains. Acala and Mebane shed uniformly during the season, whereas with Hartsville there was a gradual increase in the percentage of shedding throughout the flowering season. The percentages of shedding in Webber 49 and Deltatype Webber were very low for the early period, but rose rapidly after this, attaining the maximum after the period of greatest flowering.

Growing upland cotton in Arizona, G. E. Thompson and E. H. Pressley (*Arizona Sta., Timely Hints for Farmers, No. 148 (1924), pp. 14, figs. 4*).—Practical information is given on the varieties, cultural and field practices, and methods of pest control involved in the production of upland cotton in Arizona.

Studies in Indian oil seeds No. 2. Linseed, G. L. C. Howard and A. R. Khan (*India Dept. Agr. Mem., Bot. Ser., 12 (1924), No. 4, pp. 135–183, pls. 3, fig. 1*).—The second of this series (E. S. R., 36, p. 228) deals with the types of flax grown in India, discussing the relation between soil factors and flax types, the effect of soil conditions on growth, and secondary flowering. The biology of the flower is explained with observations on pollination and cross-fertilization, and the 121 elementary species isolated are described and classified. A brief account is given regarding the economic aspect of the crop.

Svalöf Engelbrekt oats [trans. title], Å. Åkerman (*Sveriges Utsädesför. Tidskr., 34 (1924), No. 1, pp. 4–20, figs. 2*).—Engelbrekt oats is described as a new, high-yielding black oats originated at Svalöf and adapted to southern and middle Sweden. The results of comparative tests with this and other varieties of black oats, conducted for a series of years at Svalöf and in different other localities, are given and the leading qualities of the various sorts enumerated.

From a cross between Klock II and Stormogul oats two promising strains were secured, and these were designated Klock III and Engelbrekt oats. Both strains combine to a considerable extent the earliness of Klock II with the yielding capacity of Stormogul. In the greater number of tests Engelbrekt oats proved to be as early as the Klock oats varieties. The Klock oats gave larger yields than these of both grain and straw, produced larger and better filled kernels, and were equally strong in the stem.

Effects of stimulation and depression of productivity in potato culture [trans. title], H. C. Müller and E. Molz (*Deut. Landw. Presse, 51 (1924), No. 9, pp. 91, 92, figs. 2*).—Premature harvesting of potatoes reduced the yield in the current year but resulted in increased yields when the seed was used the next year. Cutting back tops also reduced yields in the same year and, when done in the early stages of plant development, greatly depressed the yields in the following year, but, when performed at the proper time, imparted an enhanced productivity to the seed. These effects seemed to be carried over into the second year after the crop was harvested from the treated plants. Potatoes spaced 40 by 40 cm. (15.7 by 15.7 in.) produced 158.8 centners per morgen (27,727 lbs. per acre), 60 by 40 cm. 147.4, and 60 by 60 cm. 122.3 centners. When seed from these spacings were planted uniformly at 60 by 40 cm. the next year, respective yields of 118.1, 94.7, and 74.6 centners per morgen were obtained.

The use of black heart potatoes for seed, G. H. Coons (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 182–184, fig. 1*).—Observations were made on various lots of potatoes of Triumph, Rural, and Early Ohio varieties to determine the effect of black heart upon the sprouting and subsequent growth of plants. From the behavior of the seed pieces, affected tubers show a poor stand after a month or two as compared with corresponding healthy tubers. In cases where sprouts do start, bacterial decay evidently destroys the seed pieces before the young plant has become established in the soil. The slimy, rotted condition that, due to improper piling, have heated after cutting is a type of rotting which evidently continues in the soil with attendant disastrous effect on the stand. Improper handling of seed stock, the use of black heart tubers, and the planting in hot furrows which induces black heart are pointed out as common causes of uneven stands in the potato fields.

The effects of nitrates on the composition of the potato, W. P. HEADDEN (*Colorado Sta. Bul. 291 (1924), pp. 3–32*).—The composition and characteristics of potatoes and their response to an excessive supply of nitrates were studied in the Greeley district on Fort Collins loam soil. Mechanical, mass, and agricultural analyses of the soil are presented, and the nitrate problem is discussed at length. See also an earlier note (E. S. R., 37, p. 38).

Application of 800 lbs. of sodium nitrate per acre appeared to depress the phosphoric acid and increased the potash in the ash of all five varieties of potatoes more than did the amounts of nitrates available to the potatoes grown on the check plats. The composition of the potato seems to be radically modified by an excess of nitrates.

Improving the market quality of potatoes, C. E. CORMANY (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 158, 159*).—Experiments during two years indicate that on the better, more fertile potato soils there is a tendency to space the hills too far apart in the rows. The quality and uniformity of tubers in hills spaced 12 and 15 in. apart in rows 3 ft. apart were much better than for the 18-in. and wider spaced. The best planting time for late potatoes in southern Michigan seems to be the first two weeks in June. Tests with early potatoes indicate that plantings made in April or early May will give better yields and quality than those planted later if the crop is harvested August 1.

Sugar beet cultural experiments, 1923, C. E. CORMANY (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 159–162*).—The effect of date, rate, and depth of planting, spacing of plants in rows, deferred pulling, and field storage on yields of sugar beets was studied in 1923.

The early plantings yielded best, with a gradual but decided decrease for the later dates of planting. Although better stands were secured by the heavier rates of planting, the lower rates produced greatest tonnage. Beets from 8 to 14 in. apart in rows were more uniform throughout than those closer or at greater distances. The best stands resulted from surface and 1-in. plantings. Deferred pulling gave a slight gain in recoverable sugar per acre, the gain over pulling the same day lifted being 32.1 and 77.5 lbs. for the three-and four-day periods, respectively. During field storage 300-lb. open piles lost less weight and sugar than 600-lb. open piles. With one exception, the 300-lb. covered piles lost less in sugar than the 600-lb. covered piles. The 300-lb. covered piles lost in weight consistently with length of storage period, while the 600-lb. gained in weight.

Sugar-cane experiments in the Leeward Islands [1921–22], A. E. COLLENS ET AL. (*West Indies Imp. Dept. Agr., Leeward Isl. Sugar-Cane Expts., 1921–22, pts. 1–2, pp. [2]+56*).—Continuation of experiments with varieties of sugar cane in the Leeward Islands (E. S. R., 48, p. 834) showed M. 1237 and B. 6308 to lead in Antigua in pounds of sucrose per acre during 1921–22; B. 6308 and B. 3922 in pounds of sucrose during the seasons from 1918–19 to 1921–22; and B. 4596 and Sealy Seedling led varieties grown during a 15-year period. B. 6834 was first among the ratoons grown in 1921–22, and Sealy Seedling led the averages for ratoons tested during 20 years. B. H. 10 (12) averaged highest among the plant canes and ratoons tested in 1921–22 in St. Kitts, and it also headed the group of plant canes grown in Nevis. White Tanna was outstanding among plant canes in Montserrat. Unfavorable weather was the probable cause of inconclusive results in fertilizer trials in St. Kitts.

[Sugar cane experiments in Hawaii] (*Hawaii. Sugar Planters' Assoc. Proc., 43 (1923), pp. 213–254, 256–276, figs. 9*).—These pages report the continuation of work along the same general lines as noted heretofore (E. S. R., 49, p. 35), and discussed under the following titles: Cooperative Field Experiments, Substations on Oahu, and Field Experiments on Hawaii, Kauai, and Maui, all by J. A. Verret et al.; Sugar Cane Varieties, by J. S. B. Pratt, jr., H. P. Agee, T. Smith, A. D. Shamel, and J. A. Verret; and Essential Factors of Sugar Production—Sugar Cane Growth Values, by H. P. Agee.

Sunflowers under irrigation in Montana, I. J. JENSEN (*Montana Sta. Bul. 162 (1923), pp. 19, figs. 11*).—Experiments with sunflowers under irrigation in Montana are reviewed, with discussion of the problems involved in the production and utilization of the crop. The effect of sunflowers on soil fertility has been noted (E. S. R., 49, p. 129).

Mammoth Russian has given the highest average tonnage per acre, and a high yielding, early maturing strain designated Early Mammoth has been selected from this variety. Maximum yields have been obtained with early seeding and in 36-in. rows, using from 7 to 10 lbs. per acre. The number and character of irrigations will depend on conditions. Sunflowers are said to make the best silage (E. S. R., 49, p. 824) if harvested when from 50 to 60 per cent of the plants are in bloom. Good results have been obtained from using sunflowers as a soiling crop for dairy cows when 40 per cent of the plants are in bloom.

Production of sunflower seed in Missouri, H. C. HENSLEY (*Missouri Agr. Col. Ext. Circ. 140 (1924), pp. 7, figs. 3*).—Practices considered best for growing and harvesting sunflowers for seed in Missouri are discussed briefly, with comment on the uses and marketing of sunflower seed.

Bright tobacco culture in Georgia, J. C. HART (*Georgia Coastal Plain Sta. Circ. 3 (1924), pp. 8, figs. 7*).—This circular of information discusses the essential factors involved in the production of bright tobacco in Georgia.

Federation wheat, A. E. MCCLYMONDS and C. B. AHLSON (*Idaho Sta. Circ. 35 (1924), pp. 3–11, figs. 3*).—The characteristics of Federation wheat and its strains are given briefly, with the results of yields and milling and baking tests of wheat varieties in cooperation with the U. S. Department of Agriculture.

Federation outyielded Dicklow at the Aberdeen Substation and in cooperative tests with farmers. It grades higher than Dicklow, weighs more per bushel, and has practically the same crude protein and flour content with more shorts and less bran. The flour has about the same water absorption and produces a greater volume of loaf. The loaf weighs practically the same and has a little better texture but not quite as good a color as that from Dicklow flour.

A list of oriental vernacular names of the genus Dioscorea, compiled by I. H. BURKILL (*Gard. Bul. Straits Settlements, 3 (1924), No. 4–6, pp. 121–244, pls. 7, figs. 4*).—A comprehensive compilation of the oriental names of the oriental species of Dioscorea (yam) is presented, with the distribution of several species in Asia, Australasia, and Oceania. The work appears to possess considerable ethnological and etymological value.

General characters of some Philippine weed seeds, E. Quisumbing (*Philippine Agr. Rev., 16 (1923), No. 4, pp. 298–351, pls. 4*).—The origin, geographic distribution, means of dissemination, prevalence and dominance, benefits and disadvantages, and, where known, control methods are given for some of the commonest weeds of the Philippines. The seeds are described and illustrated. Of 59 species considered in this paper, distributed through 43 genera in 16 families, none are endemic.

HORTICULTURE.

Cultivated beans, Denaiffe (*Les Haricots. Paris: J.-B. Baillière & Sons, pp. IV+493, figs. 273*).—This monograph, consisting largely of varietal descriptions, includes species of Phaseolus, Canavalia, Soja, and Faba.

Farm orchards, J. G. Moore (*Wisconsin Sta. Bul. 363 (1924), pp. 35, figs. 24*).—A general discussion of farm orchards, their location, choice of varieties, culture, pruning, spraying, etc.

Hardy varieties of apples for northeastern Colorado, E. P. Sandsten (*Colorado Sta. Bul. 292 (1924), pp. 8*).—Based on records of mortality in an apple orchard consisting of 23 varieties planted in the spring of 1914, the author points out that winterkilling, a very severe drawback to apple growing in northeastern Colorado, was most severe during the first year succeeding planting. Two-year-old trees used for replacement suffered markedly less winter injury than the one-year trees originally used, indicating that older trees are better able to withstand the dry winter winds. Death of the trees was in all cases caused by trunk injuries, the roots being uninjured. Among varieties, the Wealthy proved by far the hardiest, followed in order by McIntosh and Wolf River. All the original plantings of Grimes, Stayman Winesap, Wagener, Northern Spy, King, Rome, and White Pearmain died. As a result of the studies, practical suggestions, including the protection of young orchards by windbreaks, are offered.

Own-rooted apple trees: The results of two years observations and efforts to produce trees on roots of a known variety, R. E. Marshall (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 180–182*).—In an attempt to secure own-rooted trees, the upright shoots forming on 35 one-year Hyslop crab trees, held in a horizontal and a nearly horizontal (20°) positions, were banked with earth kept moist by overhead irrigation. As a further stimulus, some of the trees were girdled at the ground level, others just below the base of each lateral shoot, and still others subjected to miscellaneous treatments, such as notching opposite the bases of the laterals, notching at the base of the tree, and scraping the bark at the bases of the laterals. At the time of digging, at the end of the second growing season, it was found that the 27 surviving trees had produced 113 rooted shoots suitable for planting purposes. Slightly more than 20 per cent of the laterals failed to root. The ringing treatments had no favorable effect on rooting. Those parent trees held at an angle of 20° with the soil surface produced fewer rooted shoots than did the trees held horizontally.

Blooming periods of apples, C. S. Crandall (*Illinois Sta. Bul. 251 (1924), pp. 113–145*).—A summary and discussion of phenological records taken on numerous varieties of apples over periods ranging from 10 to 16 years.

The full flowering period for all varieties ranged from 10 to 22 days, with an average of approximately 16 days. The earliest date of an open flower was April 2; the latest date of falling petals was May 21. Blooming periods for individual varieties varied in length between 3 and 17 days, while average periods for all years ranged from 5 to 10 days. Mean temperatures during blooming periods influenced the length of the period and the distribution of varieties into few or many-time groups, but there were enough irregularities to indicate plainly that influences other than temperature operate to modify both the length of the period and the range of distribution of varieties. Inconsistency in relative length of blooming periods was found characteristic of all varieties. Two varieties, Tolman and Whitney, having blooming periods of widely different lengths in a certain year, were found to reverse their relative positions exactly in a subsequent season.

Influences affecting the blooming periods of apple trees were found to be complex. Climatic conditions were important, but their influence was found to be modified by physiological characteristics which were obscure, difficult to isolate, and which operate to make it impossible to interpret the vagaries of blooming phenomena from the bloom records alone.

Preliminary report upon the influence of climatic conditions on the ripening processes in apples, J. R. Magness (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 108–113, figs. 6*).—Observations recorded at various points in the eastern United States upon the ripening fruits of the same apple varieties showed certain characteristics peculiar to the localities where grown. For example, northern-grown (East Lansing, Mich.) Baldwin apples were much harder during the early season than were southern-grown (Arlington, Va.,) specimens. Such differences were less marked by the time the fruit was ready to harvest.

In respect to color as an indicator of approaching maturity, studies showed that with most varieties, Baldwin excepted, the ground color may be an excellent guide. In all varieties studied, fruits continued to increase in size at a quite uniform rate as long as they were attached to the tree, even beyond the normal harvesting date. The browning of seeds, usually occurring from two to four weeks before the fruit was ready to harvest, may serve as a guide to approaching maturity, but not to the exact time for picking. With the exception of Ben Davis, fruit detached from the tree softened much more rapidly than the attached fruits.

Charts are included showing changes in size and hardness for the several varieties at the different localities.

Pruning apple and pear trees, T. J. Talbert (*Missouri Sta. Circ. 120 (1924), pp. 16, figs. 13*).—Assisted by numerous illustrations, the author discusses in a comprehensive manner the principles and practices of pruning apple and pear trees.

Some physiological effects of Bordeaux, W. C. Dutton and H. M. Wells (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 277–281*).—Observing in 1921 that the fruit of Montmorency and English Morello cherry trees in the Grand Traverse district sprayed with certain materials was notably reduced in size, the experiment was repeated in 1922 with a view to measuring the actual influence of the sprays. On a basis of 100 for the size of fruit of dusted trees, that of lime-sulphur treated Montmorency and English Morello trees graded 90 and 83, respectively, and that of Bordeaux treated trees of the same varieties 87 and 65, respectively. Records taken on Montmorency trees in 1923 gave 95 for dusted, 85 for lime-sulphur, and 63 for Bordeaux treated fruits, as compared with 100 for unsprayed fruits. Similar results were obtained at East Lansing, where the fruit of cherry trees sprayed with a hydrated lime mixture was reduced in size.

Believing that the increased transpiration of sprayed shoots might be the determining factor in the phenomenon observed, studies were instituted in

1923 with English Morello shoots, each bearing approximately the same number of leaves and cherries, cut from unsprayed and from lime-sulphur and Bordeaux treated trees. The relative water losses of these shoots were, respectively, 100, 112, and 125. As determined for unit area of leaf surface, the rates of water loss during the 24-hour wilting period were 100, 111, and 151, respectively. The immature cherries on the Bordeaux sprayed shoots were badly wilted, indicating that in this instance considerable water was drawn away from the fruit. In the case of shoots placed in water after the leaves were removed and the cherries coated with paraffin, the cherries on Bordeaux treated shoots took up over seven times as much water as did those of unsprayed shoots, apparently indicating a water deficit in the Bordeaux sprayed cherries. In 1922, a year of abundant rainfall, the fruit on Bordeaux sprayed trees was not reduced in size as much as in the succeeding season, a year of less rainfall.

Observations on apple and cherry trees following five consecutive nights of killing frosts showed that leaves previously sprayed with Bordeaux mixture were brown and dry while those of unsprayed trees were normal and green, indicating that Bordeaux mixture in some unexplained way reduced the resistance of leaves to frost.

Experiments in fertilizing peach trees, H. L. CRANE (*West Virginia Sta. Bul. 183* (*1924*), *pp. 72, figs. 24*).—Long-continued soil fertility investigations (E. S. R., 33, p. 840) in peach orchards located on two distinct soil types, one a red (Upshur) and the other a yellow (DeKalb) shale loam, showed that, of the various materials applied, singly and in combination, nitrogen carriers alone were sufficiently effective in increasing growth and yield to be deemed profitable. In the instance of Elberta trees, leguminous cover crops increased growth as much as did nitrate of soda, but failed to stimulate yield. Slight increases in yield obtained from caustic lime applied at the rate of 1,000 lbs. per acre every three years to Waddell and Carman peach trees were believed to be due to the favorable effect on the cover crop. In each of the three experiments covered in the bulletin, the use of phosphoric acid and potassium in combination resulted in inferior yields, often below that of the check trees. The addition of acid phosphate and muriate of potassium, one or both, to nitrogenous materials did not increase growth or yield above that of nitrogen used alone. Acid phosphate, however, apparently exerted a favorable influence upon cover crop growth.

Estimates of the comparative fruit-bud formation on the trees of the different plats indicated that none of the fertilizer had any marked effect on the percentage of fruit buds formed. The increased yield resulting from nitrogen applications was due to the larger number of fruits produced on an increased bearing area, associated possibly with a better set of fruit and a smaller drop. Nitrated trees produced larger, better colored, and denser foliage. However, because of the dense foliage, nitrated trees bore peaches poorer in color and later in ripening than those of the check trees. Individual fruits were not increased in size.

One hundred and fifty lbs. of stable manure per tree had the same effect on growth and yield as did 4 to 6 lbs. of nitrate of soda. The addition of phosphoric acid to manure was not effective except in increasing the growth of cover crop and of weeds.

That nitrogenous fertilizers have a long continued influence on peach trees was indicated in measurements of terminal growth of Elberta trees the second season after fertilization. A direct relationship was found between growth and the amount of nitrogen applied the previous year. The leaves of the nitrated trees were also found to be greener and more vigorous than those of nonnitrated trees. The flower buds of nitrated trees were found to be less resistant to winterkilling, especially when the nitrate was applied late in the season or in extraordinarily large quantities.

As a practical deduction, the author suggests that nitrate of soda is valuable for West Virginia orchards growing on the soil types considered, and should be used at the rate of 0.5 to 1 lb. per tree for 1- and 2-year-old trees, 2 lbs. for 3- to 4-year-old trees, 4 lbs. for 5 to 7-year-old trees, and 5 to 6 lbs. for older trees.

Fertilizing peach trees, H. L. Crane (*West Virginia Sta. Circ. 37* (*1924*), *pp. 4*).—A brief nontechnical summary of the above paper.

Growth studies of the Concord grape, A. L. Schrader (*Amer. Soc. Hort. Sci. Proc., 20* (*1923*), *pp. 116–122*).—Observations at the Maryland Experiment Station upon 50 "pencil-size" grape canes, ranging in length from 3 to 12 ft., previous to pruning to 12 buds each, showed those canes having original lengths of from 4 to 7 ft. to bear the highest average yield of fruit per cane and per fruiting buds. The optimum yield per cane occurred at the fourth buds. As a result of the study, the author suggests that strongly and weakly vegetative canes bear buds of low fruiting capacity while medium vegetative canes bear buds of maximum fruiting capacity.

Three practices, namely, (1) cutting back to two buds, (2) to a single upright cane reaching the second wire, and (3) to a single upright cane reaching the first wire, were followed in a test of methods of pruning young, vigorous vines commencing their second season's growth. Yield records taken the year following the pruning showed average yields per vine of 18, 17, and 12 lbs., respectively, for the three treatments, leading the author to conclude that strongly growing vines are capable of developing a complete framework of full-bearing capacity in two seasons' growth. Preliminary studies showed that the root development of the young vines was not increased by severe pruning of the top after the second year's growth.

Planting a citrus grove in Arizona, F. J. Crider (*Arizona Sta., Timely Hints for Farmers, No. 147* (*1924*), *pp. 11, figs. 4*).—Information is offered in this circular to prospective citrus growers on the more important practical phases of planting citrus trees in Arizona.

The solar propagating frame for rooting citrus and other subtropical plants, W. T. Swingle, T. R. Robinson, and E. May, jr. (*U. S. Dept. Agr., Dept. Circ. 310* (*1924*), *pp. 14, figs. 6*).—Working on the suggestions offered in a previously noted report (E. S. R., 46, p. 640) of the Hawaiian Experiment Station, the authors constructed a propagating frame capable of utilizing the direct radiation of the sun absorbed by water as a heating medium. Of cuttings (chiefly citrus) placed in such a frame at Washington, D. C., on June 28, 1823, five lots gave 100 per cent rooting by July 30. Avocado and lychee cuttings kept in good condition, but failed to root until after a second exposure in the frame ending August 30, at which date all of the avocados and some of the lychee cuttings had rooted. It is believed that the use of the solar propagating frame may have a considerable future in the warmer and more sunshiny sections of the United States.

Saving the gophered citrus tree, R. W. Hodgson (*California Sta. Circ. 273* (*1923*), *pp. 19, figs. 10*).—An illustrated circular in which is presented detailed information on the bridge-grafting of citrus trees which have been girdled by gophers.

The relation of humidity to the texture, weight, and volume of filberts, H. Hartman (*Oregon Sta. Bul. 202* (*1924*), *pp. 4–22, figs. 7*).—Studies with filberts of the Barcelona, Du Chilly, and Nottingham varieties, exposed to a wide range of relative humidities, indicated that humidity is a very important factor in determining the quality, the water content, and the weight of nuts. The considerable quantities of water found at ordinary humidities in both the shells and kernels of filberts increased or decreased in response to a rise or fall in humidity of the surrounding atmosphere. The rate of gain or loss of water was found to be dependent upon the (1) relative humidity of the storage chamber, (2) water content of the nuts, (3) temperature, and (4) aeration. Under like conditions, the changes in water content were greater for the kernels than for the shells.

The volume of filberts was found to vary in direct proportion to their water content, the changes being sufficient to affect the grades and standards of the marketable product. To protect filberts from mold, it is recommended that they be dried down to a water content below 12 per cent, permitting them to regain moisture before being used. Nuts that had been dried and then allowed to regain water did not differ materially in texture and quality from those kept continually moist. Nuts were in their best eating condition when containing from 12 to 15 per cent of water.

Of several wrapping mediums used for covering beakers containing filberts, paraffin-coated paper was found most successful, preventing the escape of moisture and at the same time allowing adequate ventilation.

Top-working pecan trees, G. H. Blackmon (*Florida Sta. Bul. 170 (1924), pp. 165–188, figs. 21*).—A discussion of the principles and practices of grafting and budding pecan trees, laying particular stress on the improvement of worthless seedlings.

Preliminary report on experiments with the tung-oil tree in Florida, W. Newell (*Florida Sta. Bul. 171 (1924), pp. 189–234, figs. 20*).—Following a brief account dealing with the importance of the tung-oil tree (*Aleurites fordi*) in China and its history since introduced into the United States, the author discusses experiences with the tree at the station and in other parts of Florida. It was observed that the tree comes into bearing at an early age and is reasonably hardy, being able in its dormant stage to withstand temperatures considerably below 32° F. Marked variation was noted in the yielding capacity of individual trees, suggesting the possibility of improvement by propagation of selected types. In propagation, the best success was had with seed planted in February.

Analyses of the nuts by R. E. Hardee, of the station staff, showed the kernels to contain approximately 32 per cent of oil, and 114 shelled seeds to weigh approximately 1 lb. The pomace left after the expression of the oil contains nearly 5.66 per cent of ammonia, indicating possible value as a fertilizing material. Because of the fact that the Florida produced tung oil is superior to the Chinese product now imported in large quantities for the paint and varnish industry, the author believes that the tree has a considerable future in this country.

Annual flowers for garden and greenhouse, including hardy and half-hardy biennials, T. W. Sanders (*London: W. H. & L. Collingridge, pp. 145, pls. 32*).—This book, illustrated in part in color, contains brief cultural and descriptive notes on various ornamental plants.

Garden development, T. G. W. Henslow (*London: Dean & Son, Ltd., 1923, pp. XVIII+352, pls. 99, figs. 9*).—A guide to various phases of gardening.

The complete amateur gardener, H. H. Thomas (*London and New York: Cassell & Co., Ltd., 1924, pp. XVI+513, pls. 97, figs. 39*).—As indicated in the title, this book constitutes a comprehensive guide for every phase of gardening.

FORESTRY.

Importance of forestry and the national forests (*U. S. Dept. Agr., Misc. Circ. 15 (1924), pp. 16, figs. 10*).—Brief comments are given upon the forestry situation in the United States as a whole and in the Southwest in particular. Among the items considered are the depletion of the nation's forests, the location of the major forest areas, the national forests, forest management, and the fundamental importance of adequate fire control.

[Reports of the forestry division of Louisiana], V. H. Sonderegger (*La. Dept. Conserv. Bien. Rpts., 5 [1920–21], pp. 44–63; 6 (1922–23), pp. 23–50, figs. 7*).—These reports, covering the two biennial periods ended December 31, 1923, discuss, as did the preceding report (E. S. R., 45, p. 142), fire prevention, educational and extension activities, planting operations, etc.

The forests of Maine, S. T. Dana (*Maine Forest Serv. Bul. 2 (1924), pp. 28, figs. 11*).—In connection with a general discussion of the importance of forestry in Maine, statistical and other data are presented upon the extent of the forests and forest industries of that State, pointing out that although forestry has been in practice for approximately 300 years, 78 per cent of the State is still classified as forest land, and slightly over one-third of the working population is employed in strictly woodworking industries.

Sand ridge produces valuable timber, P. A. Herbert (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 177–180*).—Observations and measurements taken on a plantation of conifers established in the spring of 1914 on an apparently worthless sandy ridge subject to wind blow showed that the eastern white and western yellow pines are not only able to survive in such environments, but also to make a vigorous growth capable of holding the sand and also of returning a profit to the owner. White pine transplants made a better growth and suffered materially less loss during their early life than did seedlings. Norway spruce and Douglas fir did not prove satisfactory, and western white spruce was a complete failure.

Nursery investigations with special reference to damping-off, J. W. Toumey and T. T. Li (*Yale Univ. School Forestry Bul. 10 (1924), pp. 36*).—A comparison of sulphuric acid and formalin as sanitation agents for preventing damping-off losses in seed beds of white pine, white spruce, and hemlock indicated that the acid, when used at the rate of $\frac{3}{32}$ fluid ounces per square foot, is the more effective medium as measured by the percentage of loss in germinated seedlings. The acid, however, had a retarding effect on the growth of the seedlings in proportion to the amount used. As measured by the height and root development and the weight of aerial portions, the formalin treatment was more favorable, apparently exerting a stimulating influence on growth. While sulphuric acid checked the germination and development of weeds, the formalin had little or no effect in this respect. Records of the number of surviving plants at the end of the season showed the largest number in the acid-treated area, next largest in the control, and the least in the formalin. In general conclusion, the authors point out that although the investigations are of a preliminary nature, extending only one year, they indicate, nevertheless, that sulphuric acid is an efficient soil sanitation agent under conditons similar to those in the experiment.

A study of comparative height growth of six planted species, H. C. Belyea (*Jour. Forestry, 22 (1924), No. 4, pp. 389–391*).—Measurements taken in the dormant season of 1922–23 on plantations of white, red, western yellow, and Scotch pines, Norway spruce, and Siberian larch established near Fulton,

N. Y., in 1908 and 1910 showed the maximum growth development in the Scotch pine, closely followed by Siberian larch and Norway spruce. The red pine, because of its sturdy, vigorous, and consistent growth and freedom from pests is deemed worthy of more general utilization for planting. The western yellow pine, the slowest growing of the six species tested, is believed to be beyond its geographical range. The white pine, normally a very rapid growing species, was, unfortunately, subject to weevil attacks.

Natural regeneration of southern white cedar, C. F. Korstian (*Ecology, 5 (1924), No. 2, pp. 188–191, fig 1*).—Samples of peat collected in the Dismal Swamp and subjected in the laboratory to temperature and moisture conditions simulating that of a cedar swamp gave rise to as high as 82 white cedar seedlings per square foot of upper inch soil, indicating that this species, like the Douglas fir (E. S. R., 51, p. 244), is strongly capable of natural regeneration following clear cutting or burning of the trees when the swamp is filled with water. On the other hand, burning during the dry period has generally resulted in the complete reversal of natural succession.

The interaction between Pinus longifolia Roxb. (chir) and its habitat in the Kumaon Hills, H. G. Champion (*Indian Forester, 49 (1923), Nos. 7, pp. 342–356; 8, pp. 405–416*).—An ecological study of the chir pine in relation to its natural range, climatic and soil preferences, and growth in various types of soil at different elevations indicated that this species, on account of its unusual characteristics, is well adapted to the habitat.

The combination of irregular but heavy seed crops with unusually high coppicing power tends to insure regeneration despite the fondness of rodents and birds for the seed and the high mortality in first-year seedlings. Young trees were observed to be tolerant to heavy shading and capable of making an unusually rapid height growth under such conditions. Older trees were found resistant to fire and to insect and fungus enemies.

Slash disposal in western white pine forests in Idaho, J. A. Larsen and W. C. Lowdermilk (*U. S. Dept. Agr., Dept. Circ. 292 (1924), pp. 20, figs. 8*).—A study of methods of slash disposal indicated that piling and burning, although an extremely expensive operation, is far superior to any other treatment. Counts of forest seedlings naturally arising subsequent to different disposal treatments showed 4,094 per acre for piled and burned areas, 3,719 for spring broadcast burned areas, and 1,010 for fall broadcast burned areas. In addition, examinations showed that the reproduction on piled and burned forest areas contained a much larger proportion of desirable species. Piling and burning not only preserved advance growth, but also protected 70 per cent of the duff or humus layer, thus favoring the quickest possible restocking of valuable evergreen species. In answer to the suggestion that with increasing fire protection no slash disposal may be necessary, the authors set forth the fact that in the past it has not been possible to prevent the entrance of fires, and that fires in untreated areas are extremely devastating and almost impossible to combat.

Forest fires in the intermountain region (*U. S. Dept. Agr., Misc. Circ. 19 (1924), pp. 16, figs. 11*).—Herein is presented information upon the work of the U. S. D. A. Forest Service in preventing and combating fires in the extensive forests of the intermountain region comprising the whole or parts of Idaho, Utah, Wyoming, Nevada, and Arizona. It is pointed out that of two causes—human carelessness and lightning—the former is responsible for more than half the fires and, being within man's control, is subject to improvement.

DISEASES OF PLANTS.

The status of plant pathology in Porto Rico, M. T. Cook (*Jour. Dept. Agr. Porto Rico, 7 (1923), No. 3, pp. 14, figs. 3*).—This is an account of phytopathology in Porto Rico, including a list of recent publications.

It is stated that 139 publications within the past 25 years deal more or less directly with the mycology and plant pathology of Porto Rico. Nearly all of these are the result of studies made on the island or of material recently collected thereon.

[Plant diseases, Ontario] (*Ontario Agr. Col. and Expt. Farm Ann. Rpt., 48 (1922), pp. 37–42*).—"This summer two diseases were brought to the attention of this department which are apparently new to Ontario, namely, pink root of onions and white rot of grapes. Both these diseases appear to be of considerable economic importance. . . .

"The symptoms of pink root [*Fusarium malli*] as observed in Ontario are dwarfing and lack of vigor of the growing tops and a dying and drying up of the roots, which usually show a faint, though fairly distinct, pink coloration."

White rot of grapes was first observed in a vineyard near Winona, Ontario, and later near St. Catharines. Observations show that it may cause very serious damage to certain commercial varieties of grapes.

Grape white rot is easily mistaken for black rot, though careful observation soon makes apparent the distinctive symptoms. The most striking character is the wilting of the berries, which at first show no sign of discoloration, rotting, or fungus parasite. One year's experiments would indicate that white rot, even on very susceptible varieties, is readily prevented by spraying with Bordeaux mixture as recommended for black rot.

Investigation during the year included cooperative experiments in weed eradication, potato disease investigation in cooperation with agricultural representatives, plat experiments with potato diseases, spraying and dusting experiments in the control of late blight of celery, field experiments to test the dry formaldehyde treatment for the prevention of oat smut, experiments in the control of pod spot or anthracnose of beans, experiments in the prevention of Rhizoctonia or black scurf of potatoes, and investigations regarding the humidity of commercial greenhouses and its effect upon the prevalence of diseases of greenhouse plants. This work is in part outlined.

Two diseases new to Ontario, J. E. Howitt (*Sci. Agr., 3 (1923), No. 5, p. 189*).—The diseases are an onion pink root (*Fusarium malli*) and a grape white rot (*Coniothyrium diplodiella*).

[Report of the plant pathologist, Bermuda, for the periods June 10 to December 31, 1921, and January 1 to May 31, 1922], H. H. Whetzel (*Bermuda Bd. and Dept. Agr. Rpts. 1921, pp. 30–64; 1922, pp. 28–32*).—The first of these reports deals with collections during 1921 of plant pathogenes, special investigations, instructions, and other activities and plans, with general and specific accounts of diseases of plants. The second is on the same general plan.

[Phytopathological contributions], L. Savastano (*R. Staz. Sper. Agrumic. e Fruttic. Acireale, Bol. 43–45 (1922), pp. [14], fig. 1*).—These bulletins, in continuation of the bulletin series previously indicated (E. S. R., 47, pp. 848, 838), record briefly information relating to insecticides, fungicides, root rot, witches' broom in certain citrus species, and brusone in the Japanese medlar.

Diseases and pests of cultivated plants in the Dutch East Indies in 1922 [trans. title], C. J. J. van Hall (*Dept. Landb., Nijv. en Handel [Dutch*

East Indies], *Meded. Inst. Plantenziekten, No. 58 (1923), pp. 42*).—Owing to the fact that the monsoon brought less rainfall than in most years, this report shows some differences in virulence of the various diseases of plants, as previously reported (E. S. R., 50, p. 548).

The mosaic situation, F. P. McWhorter (*Philippine Agr., 12 (1923), No. 2, pp. 93–95*).—This paper is a somewhat popular presentation (in the form of a review of recent work) on the subject of mosaic, which is treated as showing a bean and clover type and a tomato and potato (leaf roll) type. The views of Nelson (E. S. R., 48, p. 644), supported by those of Brandes (E. S. R., 49, p. 47), are cited as requiring corroboration but as presenting the first tangible cause of mosaic.

Insect carriers of Diplodia in storage-rots, V. M. Sarmiento (*Philippine Agr., 12 (1923), No. 2, pp. 77–91*).—This work was applied to the transmission of Diplodia on various root crops, such as cassava, gabi (taro), sweet potato, and citrus fruits. It was found that the spores of the fungus are disseminated in different ways, insects representing 10 families acting as carriers.

Insects as disseminators of plant diseases (*Phytopathology, 12 (1922), No. 5, pp. 225–240*).—This is a series of papers presented at a joint meeting of the American Phytopathological Society and the American Association of Economic Entomologists, in which F. V. Rand reviews the Results of Past Investigations; E. D. Ball discusses the Systematic Relations of Carriers, devoting attention especially to the insect transmission of curly top of sugar beets and potato hopperburn; L. Caesar summarizes the present state of Control Problems; and M. W. Gardner points out some Urgent Problems of the Future.

The relation of soil moisture and soil temperature to bunt infection in wheat, C. W. Hungerford (*Phytopathology, 12 (1922), No. 7, pp. 337–352, figs. 5*).—Attention is called to soil infestation with spores of *Tilletia tritici* in the Pacific Northwest which were blown from threshing machines. These spores readily infect the wheat crop under favorable conditions. Preliminary experiments have shown that the spores in the soil lose their power to infect rather rapidly when the soil is moist and is cultivated frequently.

The growth of the wheat scab organism in relation to hydrogen-ion concentration, J. MacInnes (*Phytopathology, 12 (1922), No. 6, pp. 290–294, fig. 1*).—A study of the H-ion concentration relations of a strain of Fusarium isolated from scabby wheat is reported, and its range is compared with the same factors for a number of other species of fungi and bacteria. The strain under observation had a range from pH 3 to pH 11.7.

Some experiments with adzuki-bean mosaic, T. Matsumoto (*Phytopathology, 12 (1922), No. 6, pp. 295–297, figs. 2*).—The author briefly describes the anatomical structures of the leaves of adzuki beans (*Phaseolus radiatus*) attacked by mosaic disease, and he also points out the varietal difference in susceptibility to this disease.

Fusaria of corn, C. D. Sherbakoff (*Abs. in Phytopathology, 12 (1922), No. 5, p. 251*).—The author claims that his studies of Fusaria associated with corn seed show that there are several species more or less commonly isolated from the seed, some of which resemble each other in their appearance on cultures ordinarily used in similar work. It is suggested that there are probably differences in the pathogenicity of the different species.

"Mosaic" disease of corn in Arkansas, R. H. Rosen (*Abs. in Phytopathology, 12 (1922), No. 5, p. 252*).—The mosaic disease of corn is said to have been noted for two successive years in the northeastern part of the State. Comparatively few plants were found attacked, but badly diseased ones were very much stunted, due principally to a shortening of the upper internodes. The plants showed chlorotic spots and stripes in great profusion and contained a compact group of shortened leaf blades, presenting a rosette appearance, at the top of the plants.

The Ascochyta blight of cotton, J. A. Elliott (*Abs. in Phytopathology, 12 (1922), No. 5, p. 250*).—A blight of cotton attributed to *A. gossypii* was reported in west-central Arkansas in 1920 and 1921.

Recent studies of Texas root rot of cotton, J. J. Taubenhaus (*Abs. in Phytopathology, 12 (1922), No. 5, p. 250*).—Studies are reported on the life history of *Ozonium omnivorum* as it affects cotton. It was found that the fungus does not live over in the soil but requires living roots, such as those of cotton plants, wild morning-glory, castor bean, etc. Successful inoculations, using *O. omnivorum*, for infection of healthy cotton plants are reported for the first time.

The principal pests and diseases of potato [trans. title], E. Marchal and R. Mayné (*Min. Agr. [Belgium] Avis aux Cult., No. 21 (1923), pp. 19, pls. 6*).—Statistical data are given regarding the importance, in Belgium, of potato culture, as introductory to a brief systematic account of the principal pests and diseases of potato.

The cooperative potato spraying project: Report for 1921, G. R. Bisby, E. E. Clayton, W. H. Martin, J. T. Rosa, jr., and E. A. Stokdyk (*Phytopathology, 12 (1922), No. 5, pp. 241–248*).—Supplementing a previous account (E. S. R., 48, p. 646), reports are given of spraying experiments carried on in Manitoba, Ohio, New Jersey, Missouri, Kansas, eastern Canada, Pennsylvania, West Virginia, Kentucky, Indiana, British Columbia, and Arizona. From results obtained this season it would appear that Ohio and Manitoba should be added as regions where the use of Bordeaux mixture for potatoes is profitable. The supplementary data given for New Jersey, West Virginia, Pennsylvania, and possibly other localities, indicate further the value of spraying. In the States of Kansas and Missouri the value of Bordeaux mixture of ordinary strength is said to be questionable.

Potato seed treatment tests in Manitoba, G. R. Bisby, J. F. Higham, and H. Groh (*Sci. Agr., 3 (1923), No. 6, pp. 219–221*).—Rhizoctonia is said to be exceedingly common on potatoes in Manitoba, due largely, it is supposed, to soil temperatures.

During 1920 Beauty of Hebron potatoes treated with solutions of mercuric chlorid, formaldehyde, and copper sulphate showed good results as regards scab, but poor results as regards black scurf. A reduplicated series of treatments during 1921 showed that the limiting factor as regards black scurf was the date of digging. Black scurf developed rapidly on the tubers, apparently beginning about the middle of August and reaching a maximum about September 9. Copper sulphate is not safe for treating in the spring. Copper dissolved in any but the purest water is precipitated out, and the strength of the solution is therefore uncertain. During 1922 black scurf could not be avoided by late planting, since the date of planting at which reduction in black scurf became evident was too late to be practicable.

The results of three years' test at Winnipeg show that sclerotia of Rhizoctonia developed in about as great numbers on the progeny of treated as of untreated tubers. Tubers dug early (the latter part of August) showed fewer sclerotia than those dug later. Black scurf could not be practicably avoided during 1922 by late planting. Seed treatment was found to reduce scab for the two years in which counts were made. A slight increase in yield was obtained from treating scurfed tubers with formaldehyde or corrosive sublimate. Copper sulphate was not found to be dependable or safe for seed treatment.

Manitoba potato growers may be able to avoid some of the loss from potato black scurf by digging early. Seed treatment was valuable for scab at Winnipeg and might have reduced black scurf in certain other areas or in other soils. The treatment of seed tubers, if unsprouted, is a sound sanitary measure applicable at least to the plats grown for seed, but soil infestation with Rhizoctonia under Manitoba conditions is such as to render the tubers extremely liable to considerable infection with black scurf, an infection which can not be avoided by seed treatment. While good yields are obtained in the Province in spite of Rhizoctonia, black scurf makes the certification of potatoes rather difficult.

Rhizoctonia solani as a potato-tuber rot fungus, M. SHAPOVALOV (*Phytopathology, 12* (*1922*), *No. 7, pp. 334–336, pl. 1*).—As a result of inoculation experiments as well as field observations the author has been led to conclude that *R. solani* is an important causative agent in bringing about the jelly type of decay of elongated stem ends of Burbank and Netted Gem potatoes in the West.

Stipple-streak disease of potato, D. ATANASOFF (*Meded. Landbouwhoogesch.* [*Wageningen*], *24* (*1922*), *No. 5, pp. 32, pls. 5*).—The object of this paper is to describe the potato stipple-streak disease, presenting relevant information gained during the previous two seasons, but largely ignoring accounts of diseases probably related more or less to stipple-streak. This account is in English, with a summary in Dutch.

A study into the literature on stipple-streak and related diseases of potato, D. ATANASOFF (*Meded. Landbouwhoogesch.* [*Wageningen*], *26* (*1922*), *No. 1, pp. 52*).—A review of the literature of potato diseases has convinced the author that the disease recently described as new under the name "streak" is in reality one of the oldest, if not the oldest, of potato diseases; that many present-day conceptions regarding the relation of leaf roll and mosaic disease to the curl, frisolée, and Kräuselkrankheit of earlier days are entirely unfounded; and that ignorance of the older literature of the subjects has caused waste, needlessly, of much time and money in research.

The object of the present paper is to bring together and review in concise form the entire available literature on this group of diseases, the related contributions covering all the running-out diseases from 1775 to 1900, but dealing only with that on streak (or, better, stipple-streak) since 1900.

The relation of the water pores and stomata of the potato leaf to the early stages and advance of tipburn, B. F. LUTMAN (*Phytopathology, 12* (*1922*), *No. 7, pp. 305–333, figs. 15*).—A form of tipburn of potatoes is described which is said to be distinct from hopperburn due to attacks of leafhoppers. This form of tipburn is said to be associated with hot, dry weather and clear, bright sunshine. It begins with hydathodes, and its further spread on the leaf is said to be due to the direct action of sunlight leading to a plasmolysis of the leaf cells.

The "gwabo" disease of paddy, E. THOMPSTONE and A. M. SAWYER (*Burma Dept. Agr. Bul. 16* (*1920*), *pp. 12*).—This account of paddy gwabo (empty husk) summarizes information regarding this condition as obtained before 1919 and presents in tabular detail, with discussion, the results of investigation during the season 1919–20.

This season was very favorable to the study of gwabo, as the trouble was unusually prevalent, appearing in every variety and planting of paddy. A careful estimate placed the average loss over the area studied at 19.87 per cent, with a total range of 1.5 to 51 per cent.

As regards the causation of the trouble, practically only two probable agents were found. These were the paddy stem borer, the larva of a moth (*Schoenobius bipunctifer*), and a soil fungus (*Sclerotium oryzae*) of the Rhizoctonia group associated with obscure symptoms and dispersed over practically all of the rice-growing areas in India. Climatic bearings require further investigation.

Sugar cane matizado [trans. title], R. H. GREY (*Rev. Azucarera y Agr., 1 (1921), Nos. 6, pp. 132–134; 7, pp. 157–160*).—A somewhat detailed account is given of sugar cane mottling since its first appearance in Cuba in 1914.

Field and storage diseases of the sweet potato and their control, L. L. HARTER (*Abs. in Phytopathology, 12 (1922), No. 5, p. 251*).—The author divides the diseases of the sweet potato into three groups: (1) Diseases of the leaves, (2) diseases of the root and stem, and (3) storage rots. It is claimed that for the first group no remedial measures are needed. For the control of diseases of the second group care should be given to seed selection, seed disinfection, the preparation of the hotbed, and crop rotation. For the control of storage rots it is suggested that the sweet potato should be dug just preceding frost, handled carefully, and placed in dry storage at a temperature of about 50 to 55° F.

Three years sweet potato certification work in Arkansas, G. G. BECKER (*Abs. in Phytopathology, 12 (1922), No. 5, p. 252*).—A brief account is given of work carried on by the Arkansas State Plant Board in the certification of sweet potato seed and slips.

A study in disease susceptibility, B. T. DICKSON (*Sci. Agr., 3 (1923), No. 9, p. 307, fig. 1*).—Tobacco plants inoculated for the study of mosaic in October, 1922, developed the usual symptoms until November 27, on which day there appeared, on several lower leaves of the mosaic plants, small spots, at first water-soaked and about pinhead size rapidly turning brown to almost white, and showing in some instances zonation and coalescence. The disease spread slowly, due to spraying and splashing. In spite of continued attempts at producing infection, no lesion occurred on any healthy plants. Cultures gave only a micrococcus, though wildfire was at first suspected. Study of the disease was continued by the author in connection with T. G. Major.

Recent advances in spraying, W. A. RUTH and V. W. KELLY (*Ill. State Hort. Soc. Trans., n. ser., 56 (1922), pp. 90–103, pl. 1*).—The present paper deals largely with detailed studies of phenomena involved in the application of common sprays, for the most part not from the standpoint of control but of the process of application.

On account of the large number of surfaces and sprays to be tested most of these studies were carried out in the laboratory, using an atomizer in preference to a larger sprayer. An especial cause for haste was the fact, discovered soon after starting the work, that the surfaces changed rapidly, in some cases markedly in a week or 10 days, in their behavior toward the sprays. The general conclusions were checked up in the field with a power machine, which was as far as the actual orchard work could be carried.

In conclusion, it may be said that varietal differences in surfaces exist and that the surface changes throughout the season in its ease of covering and in the effect which casein lime will produce. Though this is not a cure for all diseases, it should prove useful in many ways after the method of using it has been worked out in detail.

Another recent development of supposed importance is the introduction of wettable sulphur, which is made by adding a wetting agent (casein lime) to sulphur which has been very finely ground. The wetting agent not only enables wetting but tends to keep the sulphur in suspension. Continued agitation is, however, necessary, since the sulphur can not be sufficiently finely ground to stay in suspension otherwise even with the casein lime. Probably no more lime should be used than is necessary to dissolve the casein (about twice its dry weight). There are very good reasons for thinking that lime sometimes causes injury, for example by increasing the drop of fruit. A very little casein lime will produce a surprising result in promoting wetting.

Results of field experiments in spraying for 1922, F. W. Newton (*Ill. State Hort. Soc. Trans., n. ser., 56 (1922), pp. 128–139*).—Field experiments in spraying during 1922 were conducted at Olney in Richland County and Hillview in Greene County. The experiments were identical as regards the objects in view, namely, a comparison of lime sulphur having different dilutions, a comparison of Bordeaux and lime sulphur in a spray schedule as against lime sulphur throughout in a spray schedule, a comparison of dry lime sulphur with liquid lime sulphur and Bordeaux, a similar comparison of soluble sulphur combined with calcium arsenate, the fungicidal value of lead arsenate, and the effect of the use of casein as a spreader. These tests and their results are given in descriptive and tabular detail, with discussion.

The results as regards codling moth and blotch control were indefinite, and the conclusions reached relate mainly to scab control and injury to fruit and foliage. Lime sulphur applied at the rate of 1 : 40 gave the minimum amount of russet and foliage injury with the exception of weak lime sulphur. Scab control was good. On the plats receiving Bordeaux for the cluster bud sprays and lime sulphur for the subsequent sprays the percentage of scab control was among the highest. The conclusion from this year's work with Bordeaux mixture confirms the results of former years that Bordeaux is advisable for the cluster bud spray, but that on account of its russeting effect it is more advisable to use lime sulphur during the earlier cooler part of the season and Bordeaux during the later and hotter portion.

Reports are made also on commercial preparations. Dry lime sulphur produced little or no foliage injury. Slight russeting was produced on Ben Davis and Jonathan, but not on Kinnairds. Dry lime sulphur appears to be inferior to the liquid form as a fungicide, but it is considered worthy of further tests on account of its favorable effects on fruit and foliage.

Soluble sulphur and calcium arsenate together appear to be inferior to liquid lime sulphur or Bordeaux but as good as dry lime sulphur. Severe foliage injury occurred, especially around the edge of the leaves, but on account of the high finish which this spray gives the fruit it is recommended for further test.

The fungicidal value of lead arsenate appears to be higher in recent than in former tests. The average control of scab during 1922 for lead arsenate alone was 56 per cent and for Bordeaux lead arsenate as the cluster bud spray and lead arsenate thereafter 65.4 per cent. The foliage on these plats was heavy and green, with no burning. Russeting was very slight. Apparently lead arsenate must be combined with Bordeaux or lime sulphur if the maximum amount of protection is to be had from its use. The spreader used with Bordeaux increased but slightly its ability to spread. Probably this lessening effect of spreader was due to the large amount of lime. The ability of casein to spread lead arsenate was less than that with lime sulphur but more marked than that with Bordeaux.

The control of blotch and scale, W. S. Brock (*Ill. State Hort. Soc. Trans., n. ser., 56 (1922), pp. 432–446*).—This presentation (containing the author's report, with ensuing discussion) shows, from results running back as far as 1916, that as regards apple blotch, though no schedules or materials can be depended upon to give even approximately complete control during the first season, either Bordeaux mixture or lime sulphur will give satisfactory results if used frequently and heavily. No spray program for the rejuvenation of badly infected trees should be attempted without some attention given to soil treatment, of which cultivation and a liberal use of sodium nitrate or ammonium sulphate would probably be most effective. Another fact which was not even indicated in the first two seasons' experimental work was that heavy applications of lime sulphur at winter strength applied at the delayed dormant stage are partially effective in reducing the percentage of infection, although their use alone would not be considered as approaching control. The importance of early spraying is stressed, as are also pruning, the application of a drenching dormant spray of lime sulphur on the basis of commercial concentrated diluted 1:8, and thoroughness of application. The widespread use of oil sprays may, it is thought, cause an increase in blotch infection unless an additional spray of lime sulphur in the dormant season is given, especially if further work indicates the value of a dormant lime-sulphur spray in reducing blotch infection.

Fungicides, J. W. Eastham (*Sci. Agr., 3 (1923), No. 5, pp. 190, 191*).—In a communication from Victoria, B. C., it is stated that modifications recently developed in standard copper fungicides in respect to strengths and times of application practically insure control of apple tree anthracnose under almost all conditions. Fair tests of the modified Bordeaux mixture containing a large excess of lime, which, it is said, has become so popular in Nova Scotia, appear to show that the good results locally obtained are not likely to hold in general over a larger area, so that outside Nova Scotia this fungicide is not likely to supersede lime sulphur. Probably the most important innovation (or rediscovery) is in the method of application, which here employs the dry material in the form of powder. Promising results were obtained with dry Bordeaux made up with dehydrated copper sulphate and known as Sanders' copper dust, though not so good locally as were obtained with liquid Bordeaux or liquid lime sulphur. So long, however, as a liquid spray is necessary for control of sucking insects, dusting will probably remain in a secondary position.

Sprayings for apple scab, 1921 [trans. title], T. Lindfors (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 227 (1922), pp. 10, figs. 3*).—Comparative tests with two commercial sprays against apple scab, *Fusicladium dendriticum* (*Venturia dendritica*), are detailed. The results are given, with a summary of the work in German.

Brown rot of stone fruit (*Jour. Dept. Agr. Victoria, 21 (1923), No. 8, pp. 489–493, figs. 4*).—In what is said to be a copy of the report of A. A. Hammond, an account is given of experimentation to control brown rot of stone fruit. This work, which appears to be a continuation of that previously noted (E. S. R., 50, p. 552) was carried on in two orchards. In the first of these the outstanding feature developed was the superiority of lime-sulphur spray over Bordeaux mixture as applied to the control of the brown rot fungus (*Sclerotinia fructigena*). In the second only lime sulphur was used, and the best time to spray appeared to be when about 10 per cent of the blooms had expanded. If rain threatens, however, it is deemed better to defer the first application and to spray as soon as the weather becomes suitable.

Dusting vs. spraying for the control of the curculio, brown rot, and scab of peaches, O. I. Snapp (*Abs. in Phytopathology, 12 (1922), No, 5, pp. 250, 251*).—From data of two years' work in Mississippi and one in Georgia, the author claims that liquid sprays are superior to dust for the control of the curculio under heavy infestations, but for brown rot and scab control the two methods gave about equal results.

The bacterial spot of peach, J. W. Roberts and L. Pierce (*Ill. State Hort. Soc. Trans., n. ser., 56 (1922), pp. 78–90*).—An account with discussion is given of bacterial spot attacking peach, but affecting also in less degree many of the stone fruits, particularly the Japanese plum. Of peach varieties, the J. H. Hale, Elberta, Carman, Champion, and Waddell appear more susceptible than do Hiley, Belle (Belle of Georgia) Fox, Early Crawford, and Salway.

Spraying is deemed inefficient for control. An outline is given chiefly of experimentation during several years on controlling peach-leaf bacterial spot by cultural methods looking to increasing the vigor of the trees.

The control of root knot, J. A. McClintock (*Abs. in Phytopathology, 12 (1922), No. 5, p. 250*).—In connection with experiments to control the root-knot nematode through the use of resistant plants, the author reports a seedling peach which has been proved resistant to this nematode.

Mosaic and leaf curl (yellows) of the cultivated red raspberry, W. H. Rankin and J. F. Hockey (*Phytopathology, 12 (1922), No. 6, pp. 253–264*).—This is a detailed account of investigations previously noted (E. S. R., 50, p. 751).

[Grape protection], A. Sintoni and M. Soave (In *R. Laboratorio Autonomo di Chimica Agraria Forlì. Annuario, 1912–1921. Piacenza: Fed. Ital. Consorzi Agrari, 1922, pp. 101–104*).—Experimentation during 1916–1918 with treatments employing reduced percentages of fungicides showed good results. Bordeaux mixture having 250, 500, and 650 gm., respectively, of copper sulphate per hectoliter of water proved to be equal to standard 1 per cent Bordeaux. It is thought that the 0.5 per cent copper strength may be safely adopted.

Witches' broom in citrus plants [trans. title], L. Savastano (*Ann. R. Staz. Sper. Agrumic. e Fruttic. Acireale. 6 (1922), pp. 119–124, pls. 6*).—In 1914. the author observed for the first time the disease called scopaccio, or witches' broom, affecting in severe form lemon and in much milder form orange trees in orchards at Palermo. Five stages of development are presented. No cure is claimed, but severe pruning in 1915 resulted in freedom from the trouble, as shown by examination seven years later.

Pathogenicity of the olive knot organism on hosts related to the olive, C. O. Smith (*Phytopathology, 12 (1922), No. 6, pp. 271–278, pls. 2*).—The author reports having produced typical artificial knots with pure cultures of the olive-knot organism (*Pseudomonas savastanoi*) on Adelia and two species of Fraxinus. Inoculations on Chionanthus and Osmanthus did not usually result in the production of galls or knots, yet there appeared to be a very positive pathological effect, especially a stimulation of the growth of tissue followed often by a slight necrosis.

Fasciation and prolepsis due to crown gall, E. F. Smith (*Phytopathology, 12 (1922), No. 6, pp. 265–270, pls. 5*).—Examples of fasciation and prolepsis in the cultivated nasturtium (*Tropaeolum majus*) due to *Bacterium tumefaciens* are figured and described.

Potential sporidia production per unit in Cronartium ribicola, M. W. Taylor (*Phytopathology, 12 (1922), No. 6, pp. 298–300, fig. 1*).—Actual counts of telial columns were made on 68 leaves of 12 species of Ribes, and the production per unit was determined by planimeter measurement of the leaves.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Birds and their young, T. A. Coward (*London: Gay & Hancock Ltd., 1923 pp. VIII+151, pls. 44*).—A popular account of birds and their life. The illustrations are by R. Green, 12 plates being in colors.

Birds of Alabama, A. H. Howell (*Montgomery: Ala. Dept. Game & Fisheries, 1924, pp. 384, pls. 7, figs. 31*).—This work, issued by the Department of

Game and Fisheries of Alabama in cooperation with the U. S. D. A. Bureau of Biological Survey, was undertaken during parts of the years 1908 and 1911–1916. A biological survey of Alabama, dealing with the physiography and life zones and with the mammals of the State, by the author, has been noted (E. S. R., 46, p. 245). In the present work the author deals with the history of Alabama ornithology, etc., presents an annotated list of species, a bibliography of 10 pages (pp. 363–372), and an index.

Guide to the birds of Europe and North Africa, R. G. W. RAMSAY (*London: Gurney & Jackson, 1923, pp. XI+355, pl. 1*).—This work is edited by W. E. Clarke, who presents a biographical memoir of the late author.

List of birds of prey, 1898–1923, with notes on their longevity, S. S. FLOWER (*Egypt Min. Pub. Works, Zool. Serv., Pub. 37 (1923), pp. [2]+46*).—This is based upon observations of nocturnal and diurnal birds of prey received at the Giza Zoological Gardens from 1898 to 1923.

Birds attacking freshly shorn sheep (*Science, 59 (1924), No. 1529, p. X*).—This is an account of observations in California by S. S. Berry, who found that magpies would perch on the rump of sheep and peck and tear at the flesh until they opened a hole through the thin coating of wool left after shearing and then into the body cavity in an endeavor to reach the kidneys. It was observed that they usually start on animals showing bad shearing cuts, but with the development of the habit the birds became so bold that they would attack uninjured animals. A considerable number of attacks extending over a period of several years was observed, but the observer is inclined to believe that they are sporadic and not indicative of a general habit on the part of the bird.

Notes on the longevity and infectivity of hookworm larvae, J. E. ACKERT (*Amer. Jour. Hyg., 4 (1924), No. 3, pp. 222–225*).—The author found that the sheathed hookworm larvae, probably *Necator americanus* Stiles, lived 18 months in a culture of cistern water, the temperatures to which they were exposed varying from 45 to 98° F., with fluctuations between 60 and 85° most of the time.

Experience with the stoll egg counting method in an area lightly infested with hookworm, N. C. DAVIS (*Amer. Jour. Hyg., 4 (1924), No. 3, pp. 226–236*).—The author presents figures which indicate that the number of eggs per hookworm female per day and the number of eggs per female per gram of feces were much greater in the Brazilian locality studied than they were in Porto Rico.

[Economic insects and their control in Illinois] (*Ill. State Hort. Soc. Trans., n. ser., 56 (1922), pp. 37–48, 106–109, 118, 119, 128–139, 167–175*).—Papers here presented include Directions for Making Spray Mixtures (pp. 37–46); The Peach Borer and Methods of Control, by W. P. Flint and S. C. Chandler (pp. 46–48); A Report of the Scale Situation and the Use of the New Government Oil Emulsion in Arkansas, by W. S. Perrine (pp. 106–109); Recording the Data on 1922 Spraying, by R. A. Simpson (pp. 118, 119); Results of Field Experiments in Spraying for 1922, by F. W. Newton (pp. 128–139), noted on page 547; and A New Spray for the San José Scale, by W. P. Flint (pp. 167–175).

The work by Flint and Chandler indicates that it is safe to use paradichlorobenzene under Illinois conditions on any tree more than one year old. Practically all of the trees treated in 1921 were only one year old, and no injury resulted.

In reporting upon control work with the San José scale, it is stated that over 1,000 acres of orchard in Illinois have been killed by this pest during the past three years, most of which trees had been receiving dormant spray for scale control. In control work with lubricating oil emulsions, an emulsion made by mixing 1 gal. of Diamond paraffin or similar grade of oil with 0.5 gal. of water in which 1 to 2 lbs. of potash fish oil soap had been dissolved and boiling the mixture for approximately five minutes has a high killing power, being fully as effective as commercial miscible oils.

[Economic insects in Kansas] (*Kans. Univ. Sci. Bul., 14 (1922), Nos. 1–21, pp. 27–171, 213–298, 315–323, 393–405, 513–587, figs. 358*).—Among the papers here presented which relate to insects of economic importance are the following: The Membracidae of Kansas (Homoptera) (pp. 27–110) and The Genus Acinopterus (Homoptera) (pp. 111–139), both by P. B. Lawson; The Life History of the Toad Bug (Heteroptera), by H. B. Hungerford (pp. 143–171); Ovipositors of the Cicadellidae (Homoptera), by P. A. Readio (pp. 213–298); A Problem in the Relation of Temperature to Rate of Insect Development, by P. A. Glenn (pp. 315–323); The Larva of a Chironomid (Diptera), by P. W. Claassen (pp. 393–405); and Biology and Morphology of *Lepyronia quadrangularis* (Say) (Homoptera, Cercopidae), by K. Doering (pp. 513–587).

Report of the Canadian Arctic Expedition 1913–18.—Volume III, Insects (*Ottawa: Dept. Mines, 1919–1922 pp. 8+XI+pts. A–L, pp. 29A, figs. 72; pp. 5B, figs. 4; pp. 90C, figs. 108; pp. 12D, figs. 4; 27E, figs. 11; pp. 5F, pp. 38G, figs. 4; pp. 22H, figs. 28; pp. 58I, pls. 6; pp. 4J; pp. 61K, figs. 21; pp. 10L*).—This consists of reports by specialists on the insects collected in the expedition under the command of V. Stefansson. The volume concludes with an account of the Insect Life on the Western Arctic Coast of America, by F. Johansen. A general index to the volume is included.

Economic insects in Sweden from 1917 to 1921 [trans. title], O. LUNDBLAD and A. TULLGREN (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 249 (1923), pp. 60, fig 1*).—Notes are presented upon insects of importance during this five-year period.

Insect pests of cotton, C. B. SYMES (*Rhodesia Agr. Jour., 21 (1924), No. 2, pp. 136–151, pls. 4*).—These are preliminary notes on the insect enemies of cotton in Rhodesia.

The life history and control of insects affecting sugar-cane in north Queensland, E. JARVIS (*Queensland Agr. Jour., 21 (1924), Nos. 1, pp. 28–33; 2, pp. 91–97*).—This is a summarized account of the more important sugar cane insects in north Queensland.

Insect enemies of the coconut in Brazil, G. BONDAR (*Insectos Damninhos e Molestias do Coqueiro (Cocos nucifera) no Brasil. Bahia: Insp. Serv. Agron. e Met., 1922, pp. 112, figs. 73*).—This is an account of the insects attacking *C. nucifera* in Brazil.

Studies on Rickettsia-like micro-organisms in insects, M. HERTIG and S. B. WOLBACH (*Jour. Med. Research, 44 (1924), No. 3, pp. 329–374, pls. 4*).—The authors report that a survey of the rapidly growing list of microorganisms described under the name Rickettsia, including not only pathogenic forms transmitted by bloodsucking insects but harmless parasites and symbionts of nonbloodsucking insects as well, indicates that this type of organism is one more or less generally distributed throughout the whole group of arthropods. The present paper includes a tabular summary of Rickettsia-like organisms in arthropods and a list of 41 references to the literature.

The biology of the roach, Blatta orientalis Linn., P. RAU (*Acad. Sci. St. Louis Trans., 25 (1924), No. 4, pp. 57–79, fig. 1*).—This account of *B. orientalis* includes tabular data.

The potato-beetle destroyer, Perillus claudus: A stinkbug enemy of the potato-beetle, E. I. MCDANIEL (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp.*

185, 186 fig. 1).—This is a brief popular account of a pentatomid enemy of the potato beetle which has been known in Michigan for the past 20 years as a natural enemy of this pest.

Lubricating oil emulsion for the control of San José scale, D. ISELY (*Ark. Agr. Col. Ext. Circ. 164* (*1924*), *pp. 4*).—The author calls attention to the fact that lubricating oil emulsion is now recognized as the most satisfactory spray material for use in the control of San José scale, a 2 per cent solution, or 3 gal. of the stock emulsion to 100 gal. of water, being recommended. It is stated that this material offers all that can be desired in efficiency, since in experimental work practically 100 per cent of the scales hit were killed. In contrast with lime sulphur, which is most effective only in early spring, it may be used at almost any time during the dormant season when the weather is warm enough to permit spraying without reduced efficiency.

"The fact that oil emulsion is not caustic, as is lime sulphur, takes away much of the disagreeableness which accompanies dormant spraying. At present the cost is about one-half as great as that of lime sulphur, which is the cheapest of the other insecticides used for the control of scale."

Spraying for oyster-shell scale, R. A. COOLEY, J. R. PARKER, and W. S. REGAN (*Montana Sta. Circ. 124* (*1924*), *pp. 15, figs. 4*).—Experimental spraying for oyster-shell scale in the Bitter Root Valley of Montana during a period of seven years has shown lime sulphur, linseed oil emulsion, and Dormoil to be the most promising materials. The program which has been found to be the most effective consists in three applications of lime sulphur as follows:

Delayed dormant spray. Just before the leaf buds open (not later than when the buds show 0.25 to 0.5 in. green), at a strength of 1 to 9 (20 gal. of 28° B. lime sulphur to the 200-gal. tank). When the blossom buds show pink, and again when the petals are falling, spray with a strength of 1 to 24 (8 gal. of 28° B. lime sulphur to the 200-gal. tank). If the codling moth is present, arsenate of lead at the rate of 6 lbs. to the 200-gal. tank should be added to the lime sulphur mixture applied when the petals are falling. If the fruit-tree leaf-roller is present, Dormoil at a strength of 1 to 11.5 (16 gal. to the 200-gal. tank) or some other equally good oil spray should be substituted for lime sulphur in the delayed dormant spray.

Contribution to the biology of the body louse (Pediculus corporis de Geer-vestimenti Nitzsch) [trans. title], A. HASE (*Flugschr. Deut. Gesell. Angew. Ent., No. 1* (*1915*), *pp.* [*3*]+*95, figs. 47*).—This report of investigations of the life history and bionomics of this parasite has been previously noted from another source (E. S. R., 35, p. 460.)

Gipsy moth control work (*N. Y. State Conserv. Comn. Ann. Rpt., 13* (*1923*), *pp. 158–169, pl. 1, figs. 6*).—An account is given of a conference of representatives of the U. S. and Canadian Departments of Agriculture, the New England States, New York, and New Jersey at Albany in November, 1922. The conferees are said to have been unanimously in favor of establishing a barrier zone in an attempt to prevent the further westward spread of the gipsy moth, the proposed zone [illegible] consist of a strip of varying width with relatively little woodland extending along the Harlem, Hudson, and Champlain Valleys from Long Island Sound to the Canadian border.

In investigations of the spread by wind of newly hatched caterpillars of the gipsy moth, a study was made of wind or air currents, in the course of which nearly 7,000 hydrogen-inflated toy balloons were released from 11 stations in 4 States, between May 11 and June 8, of which 422, or more than 6 per cent, of the tags attached to the balloons were returned. A map showing the gipsy moth distribution in 1923 and the points of recovery of tags from balloon liberations is attached.

Hyponomeuta malinella Zell. and its parasites in the region of Gâtinais, France, in 1923 [trans. title], L. Gaumont (*Rev. Path. Vég. et Ent. Agr., 10 (1923), No. 4, pp. 326–331, figs. 5*).—The parasites of *H. malinella* observed by the author include *Pimpla examinator* Fab., *Pteromalus variabilis* Ratz., *Tetrastichus crassinervis* Thoms., and *Ageniaspis fuscicollis* Dalm.

The plum moth (Argyresthia pruniella L.) in Sweden and its control [trans. title], O. Lundblad (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 247 (1923), pp. 26, figs. 20*).—This is a general account of *A. pruniella*, which occurs commonly and is often very injurious in southern and central Sweden. The paper includes a list of 27 references to the literature cited.

Control of the sugar cane moth borer, T. E. Holloway and W. E. Haley (*Facts About Sugar, 18 (1924), No. 18, pp. 418, 419*).—In this paper agents of the U. S. D. A. Bureau of Entomology present suggestions for control of the pest.

The spruce budworm situation in New Brunswick, F. C. Craighead (*New Brunswick Crown Land Dept. Ann. Rpt., 62 (1922), pp. 82–84, fig. 1*).—This is a discussion of the status of the spruce budworm based upon investigations conducted by the entomological branch of the Dominion Department of Agriculture in cooperation with the Crown Lands Department.

The fruit-tree leaf-roller, Cacoecia argyrospila Walk., and its control in British Columbia, E. P. Venables (*Canada Dept. Agr., Ent. Branch Circ. 10 (1924), pp. 4, figs. 4*).—This is a summary of information of the life history and habits of this pest and means for its control in the Okanagan Valley, where it came into prominence in 1922.

Codling worm life history for Ohio and the spraying program, H. A. Gossard (*Ohio State Hort. Soc. Proc. 56 (1923), pp. 60–67*).—This is a practical summary of information.

The pickle worm and its control, K. C. Sullivan (*Missouri Sta. Circ. 122 (1924), pp. 4, figs. 2*).—This is a brief practical summary of information on *Diaphania nitidalis* (Cramer).

The bionomics of the white coffee-leaf miner, Leucoptera coffeella Guér., in Kenya Colony (Lepidoptera, Lyonetiidae), H. E. Box (*Bul. Ent. Research, 14 (1923), No. 2, pp. 133–145, figs. 9*).—This report of the author's studies includes a bibliography of 35 titles.

The house fly and how to suppress it, L. O. Howard and F. C. Bishopp (*U. S. Dept. Agr., Farmers' Bul. 1408 (1924), pp. II+17, figs. 9*).—This is a revision of and supersedes Farmers' Bulletin 851, previously noted (E. S. R., 38, p. 60).

The Mediterranean fruit fly (Ceratitis capitata Wied.), G. Quinn (*Jour. Dept. Agr. So. Aust., 27 (1924), No. 9, pp. 852–855, figs. 6*).—This is a brief account of *C. capitata*, recent outbreaks of which have occurred in orchards in Victoria and New South Wales.

Further observations on the prevalence and habits of Oscinella frit, Linn., N. Cunliffe (*Ann. Appl. Biol., 11 (1924), No. 1, pp. 54–72, figs. 3*).—In continuation of observations previously noted (E. S. R., 47, p. 853), the author reports upon the prevalence of *O. frit* in the field from 1919 to 1922.

Investigations of the Japanese Melolonthidae, II [trans. title], Y. Niijima and E. Kinoshita (*Hokkaido Imp. Univ., Col. Agr., Expt. Forests Research Bul., 2 (1923), No. 2, pp. [2]+253+7, pls. 7, figs. 13*).—This second part of a work on the melolonthid beetles of Japan includes descriptions of 28 species new to science, records their distribution, etc. The first part of the work[4], in which control measures are considered, is by Y. Niijima, K. Kusunoki, and Y. Tomimoto.

The two-coloured coconut leaf beetle (Plesispa reichei Chap.), G. H. Corbett (*Fed. Malay States Dept. Agr. Bul. 34 (1923), pp. 20, pls. 3*).—This is a report of studies of a chrysomelid which is an important pest of the coconut palm in Malaya. Much of the data relating to its biology is presented in tabular form.

The Mexican bean beetle in the East, N. F. Howard (*U. S. Dept. Agr., Farmers' Bul. 1407 (1924), pp. II+14, figs. 10*).—This is a summary of information on the Mexican bean beetle and means for its control in the eastern United States.

Injury to fire-killed lumber in New Brunswick by the softwood borer, J. D. Tothill (*New Brunswick Crown Land Dept. Ann. Rpt., 63 (1923), pp. 86, 87*).—This is an account of the injury caused by *Monohammus scutellatus*, which follows fires occurring in May, June, or July.

Wood borers damaging timber in Australia, T. C. Roughley and M. B. Welch (*[N. S. Wales] Technol. Mus. Bul. 8 (1923), pp. 27, figs. 18*).—In this paper particular attention is given to borers which attack seasoned and seasoning timbers.

The coffee-berry borer (Stephanoderes hampeï Ferrari = coffeae Hagedorn), I, II [trans. title], S. Leefmans (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Inst. Plantenziekten, No. 57 (1923), pp. 94; 62 (1924), pp. 99, pls. 5*).—The first paper deals with the life history and ecology of this pest and the second with control measures. English summaries accompany the two papers, and a list of 18 references to the literature is included in the second. An account of this insect, by Roepke, has been noted (E. S. R., 45, p. 559).

The strawberry-root weevil (Brachyrhinus ovatus Linn.) (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 33, rev. ed. (1924), pp. 12, figs. 5*).—This revision of the circular previously noted (E. S. R., 46, p. 159) has been prepared by W. Downes.

Plantain root beetle borer (Cosmopolites sordidus Germar), N. K. Jardine (*Ceylon Dept. Agr. Yearbook, 1924, pp. 55–58, pl. 1*).—An account of the banana root-borer, which is increasing in importance and is a menace to plantain in Ceylon.

The boll weevil: Approved and recommended method for combating the boll weevil for 1924 and facts relative to the boll weevil's life history, C. E. Sanborn and G. Briggs (*Okla. Agr. Col. Ext. Circ. 193 [1923], pp. 8*).—This is a summary of important measures for boll-weevil control as endorsed by the Oklahoma Experiment Station.

The banana weevil borer, J. L. Froggatt (*Queensland Agr. Jour., 21 (1924), No. 4, pp. 275, 276*).—An account is given of investigations conducted by the author in Queensland, where breeding is continuous throughout the year with two main breeding periods, one in spring, the other in the fall.

The plum curculio on peaches in North Carolina: Its life history and control, R. W. Leiby and J. B. Gill (*N. C. Dept. Agr. Bul., 1923, Mar., pp. 23, figs. 6*).—This is a report of studies of the life history and habits of the plum curculio by the senior author, assisted by J. F. Tarlton, at Aberdeen, during the season of 1922, and of field experiments in dusting and spraying conducted by the authors cooperatively, the former representing the North Carolina Department of Agriculture and the latter the U. S. D. A. Bureau of Entomology.

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[4] [Hokkaido Imp. Univ., Col. Agr., Expt. Forests Research Bul.], 1917, No. 5.

The spraying schedule recommended includes four applications as follows: (1) Immediately after the petals fall, using 1 lb. of powdered arsenate of lead, plus lime water in which 3 lbs. of good stone lime has been slaked, to each 50 gal. of water, (2) when the calyxes or shucks are shedding, which is about 10 days after the falling of the petals, using the same spray as for the first application, (3) 2 weeks after the second application or about 4 weeks after the petals have fallen, using 1 lb. of powdered arsenate of lead with each 50 gal. of 8-8-50 self-boiled lime sulphur, and (4) about 4 weeks before each variety is due to ripen, using the same spray as recommended for the third application. Varieties ripening previous to the Carman should receive three applications of dust or spray, which are to be made at the times recommended in the schedules for the first, second, and fourth treatments.

Where dusting is followed, the 80-5-15 mixture, composed of 80 per cent sulphur, 5 per cent arsenate of lead, and 15 per cent hydrated lime, is recommended. "The applications should be made at the same times that the spray applications are recommended, the same dusting formula being used for all dust applications."

Alfalfa weevil and its control in Idaho, C. Wakeland (*Idaho Sta. Circ. 34 (1924), pp. 3-11*).—This general account of the alfalfa weevil consists of descriptions of its several stages, an account of its feeding habits and injury, cultural aids to weevil control, cultural abuse, and control methods, including brush dragging, early cutting, pasturing with sheep, and spraying. It is shown that in extensive work the past four years the cost of spraying an acre twice, or the cost per acre per year, amounted to $1.62, which resulted in a net saving per acre from spraying of $7.72.

Apiculture, I, II [trans. title], E. Zander (*Flugschr. Deut. Gesell. Angew. Ent., Nos. 5 (1917), pp. 40, figs. 28; 6 (1922), pp. 47, figs. 36*).—Part I of this work deals with the beehive and rearing of bees and Part II with the rearing and care of queen bees.

Report of the Dominion apiarist, C. B. Gooderham (*Canada Expt. Farms, Bee Div. Rpt., 1923, pp. 24, figs. 9*).—The details of work with bees in 1923 are presented. The experimental work included studies of bees as agents in cross-pollination, a foundation experiment, swarm control, breeding experiments, a comparison between Jumbo and Langstroth hives, wintering two queens in one hive, aluminum combs, and wintering at Ottawa during 1922-23 and 1923-24.

How to succeed with bees, E. W. Atkins and K. Hawkins (*Madison, Wis.: Authors, 1924, pp. 96, figs. 63*).—This is a practical account of beekeeping.

On the genera of the ichneumon flies of the tribe Paniscini Ashmead, with descriptions and discussion of related genera and species, R. A. Cushman (*U. S. Natl. Mus. Proc., 64 (1924), Art. 20, pp. 48, figs. 7*).—This is a review of the genera of the tribe Paniscini, in which 3 genera are erected and 33 forms described as new to science.

Chalcis femorata Panz., a new hymenopterous parasite of the chrysalis of Pieris brassicae L. [trans. title], A. Paillot (*Rev. Path. Vég. et Ent. Agr., 10 (1923), No. 4, pp. 342-345*).—The author reports that parasites of the pupal stage of the cabbage butterfly, which caused considerable injury, were particularly abundant during 1923. Two species were reared, one the well-known *Pteromalus puparum*. The other, though not previously recorded as a parasite of pierids, is thought to be *C. femorata*.

Apples attacked by the larvae of the dock sawfly (Ametastegia (Taxonus) glabrata Fallén), F. R. Petherbridge (*Ann. Appl. Biol., 11 (1924), No. 1, pp. 24-30, figs. 3*).—The author reports that the larva of *A. glabrata*, which is a leaf feeder usually found on docks and polygonums, injured apples in East Norfolk by boring small holes into the flesh (from one to six in each fruit) in which to pupate.

The European red mite, J. S. HOUSER (*Ohio State Hort. Soc. Proc., 56 (1923), pp. 56–59*).—This is a brief account of *Paratetranychus pilosus* C. & F., which was found for the first time in Ohio in January, 1923, in apple orchards at Youngstown, Wooster, and Port Clinton.

FOODS—HUMAN NUTRITION.

Basal metabolism, W. M. BOOTHBY and I. SANDIFORD (*Physiol. Rev., 4 (1924), No. 1, pp. 69–161, figs. 4*).—The problems on basal metabolism that are under active investigation in this country at present form the subject of this review. The material is discussed under the following headings: Apparatus, standard conditions for determination of basal metabolism, regulation of the body temperature, specific dynamic action of foods, fasting and undernutrition, the effect of work, pregnancy, menstruation, drugs, the basal metabolic rate in diseases other than thyroid, leukemia, thyroxin and myxedema, adenomatous goiter with hyperthyroidism and exophthalmic goiter, adrenalin, insulin, diabetes, and the basal metabolism and respiratory quotient in relation to a possible conversion of fat into a carbohydrate-like substance.

The extensive bibliography appended contains a list of general reviews and books, followed by separate bibliographies from the various metabolism laboratories and a list of general references on the subject since 1920.

Effect of a small breakfast on the energy metabolism of children, V. BAUER and K. BLUNT (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 77–82*).—"In the effort to find whether basal metabolism determinations on children may safely be made at noon instead of before breakfast, seven children were repeatedly observed early in the morning and again on the same day about four hours after a small breakfast. The average oxygen consumption at the later hour was only 0.6 per cent higher than before the meal. The use of the noon hour is, therefore, to be considered safe as a routine procedure provided the breakfast does not exceed 470 calories, with not more than 14 gm. of protein, and is eaten at least four hours before the metabolism observation."

The use of sweetened condensed, evaporated, and powdered milks for feeding infants in the Tropics, W. E. DEEKS (*Amer. Jour. Trop. Med., 4 (1924), No. 2, pp. 113–130*).—Brief directions are given for the preparation of milk formulas for infant feeding from sweetened condensed, evaporated, and powdered milk. Suggested diets for infants from 10 or 12 to 15 months and from the fifteenth to the eighteenth month are included.

The cholesterol content of human milk, F. W. FOX and J. A. GARDNER (*Biochem. Jour., 18 (1924), No. 1, pp. 127–135*).—Data are reported on the content of fat, unsaponifiable matter, and cholesterol in 27 samples of human milk taken at various stages of lactation.

The average cholesterol content of 19 samples from the first to the twelfth day of lactation was 0.03 gm. per 100 cc. of milk. The average of 2 samples from the twelfth to the thirtieth day of lactation was 0.031, of 4 from the thirtieth to the two hundred and seventieth day 0.027, and the content of 1 sample at a considerably later date was 0.026 gm. The average results of these and other observers also showed a higher cholesterol content in the early than in the later periods of lactation.

Clinical calorimetry, XXXV, XXXVI (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 43–58, figs. 6*).—In continuation of the series previously noted (E. S. R., 51, p. 465), two papers are presented.

XXXV. *A graphic presentation of the respiratory quotient and the percentage of calories from protein, fat, and carbohydrate*, E. F. Du Bois (pp. 43–49).—This paper contains the diagram shown in a previous paper (E. S. R., 51, p. 263), a similar diagram giving the calorific value of a liter of oxygen plotted according to the respiratory quotient and percentage of calories, and an illustration of the use of the first diagram as a metabolism map by means of which one may follow the changes in metabolism caused by disease or by the administration of various diets.

XXXVI. *A graphic method of determining certain numerical factors in metabolism*, A. M. Michaelis (pp. 51–58).—This paper, which should be consulted in the original, presents and describes the derivation and use of charts by means of which the calculation of the more important numerical values required in metabolism determinations is simplified.

The nutritive value of the vegetable proteins, T. B. Osborne (In *The Vegetable Proteins. London and New York: Longmans, Green & Co., 1924, 2. ed., rev., pp. 95–109*).—This chapter in the monograph noted on page 501 consists of a critical review of the literature on the subject.

The reciprocal transformation of creatin and creatinin, VI [trans. title], A. Hahn and L. Schäfer (*Ztschr. Biol., 80 (1924), No. 3–4, pp. 195–210*).—This continuation of the investigation previously noted (E. S. R., 49, p. 613) consists of a repetition of the experiments noted in the fourth paper of the series (E. S. R., 49, p. 560), in which an attempt was made to trace the change from creatin to creatinin in the body by feeding or injecting known amounts of creatin and making subsequent determinations of creatinin. The feeding experiments were conducted on human subjects and the injection tests on rabbits and human subjects.

The results confirm the previous observation that the feeding or injection of creatin is not followed by an increase in the amount of preformed creatinin. Of the subcutaneously-injected creatin, the amount recovered in the urine was variable. Occasionally it was quantitative, but at other times only a small percentage was recovered. The possibility is suggested that in the breaking down of creatin substances of unknown nature may be formed.

The amino acid content of the blood in normal and pathologic conditions, C. H. Greene, K. Sandiford, and H. Ross (*Jour. Biol. Chem., 58 (1924), No. 3, pp. 845–857, figs. 5*).—Data are reported and discussed on determinations by the Folin colorimetric method of the amino acid content of 458 samples of blood, 20 of which were obtained from normal persons and the remainder from subjects suffering from various pathological conditions.

The minimum, maximum, and average results for the normal samples were 5.2, 7.2, and 6.37 mg. of nitrogen in 100 cc. of whole blood. Corresponding figures averaged from all the determinations were 4.6, 8.6, and 6.32 mg., respectively. The slight variation in the amino acid content in the presence of severe metabolic disturbances is considered to be "direct evidence of the widespread and fundamental nature of the deamination processes in the body."

Nutrition and growth on diets highly deficient or entirely lacking in preformed carbohydrates, T. B. Osborne and L. B. Mendel (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 13–32, figs. 8*).—The authors, with the assistance of H. C. Cannon, have extended their investigation of growth on diets containing a minimum of carbohydrate (E. S. R., 45, p. 764). The types of diet used and the results obtained may be summarized as follows:

Diets extremely poor in both carbohydrates and fats and consequently very rich in proteins.—A typical diet of this kind consisted of meat residue 90, gliadin 5, and salts 5 per cent, with yeast 200 mg. and alfalfa meal 400 mg. to furnish the necessary vitamins B and A, respectively. In other diets of this series the meat residue was replaced by casein and the gliadin by zein. On these diets the rats grew at an excellent rate to an average of about 250 gm., the highest weight reached being 336 gm. That this combination was not the most ideal was shown by renewal of growth on a mixed diet or on a diet in which some of the protein was replaced by fat. Other points noted were that the calorie intake was not much larger than on mixed rations, and that the diets did not cause diarrhea but marked diuresis, with enlargement of the kidneys.

Diets extremely poor in carbohydrate but containing both proteins and fats.—In this series the various diets tested were approximately of the following composition: Protein 50 to 55, salts 5, agar 0 to 5, lard 31 to 40, butterfat 0 to 9, and cod liver oil 0 to 3 per cent, with dried yeast 400 mg. Five different proteins were used, meat residue, casein, edestin, lactalbumin, and egg white. Growth was on the whole better than with diets furnishing no fat. Good growth to large size was in many cases obtained. The glycogen content of the body in the three cases examined was comparable to that of control animals on starch-containing food. It is of significance that in many of the rations there was entire absence of roughage to produce bulk in the feces. In three cases no vitamin A was supplied for a time, but when butterfat was added there was prompt resumption of growth.

Diets entirely devoid of preformed carbohydrate.—In this series the protein consisted of preparations of casein, edestin, and lactalbumin, none of which gave the Molisch carbohydrate reaction. These were fed to the extent of 55 per cent of the diet, which consisted otherwise of salts 5, lard 31, and butterfat 9 per cent, with from 40 to 80 mg. of a yeast fraction giving no Fehling reaction. Excellent growth was obtained, particularly in the casein group.

Diets extremely poor in carbohydrate but containing protein and fatty acids.—The diets in this series consisted of salts 5, casein from 80 to 64, and fatty acids from 15 to 25 per cent, with glycerol 6 per cent in one case. The mixed fatty acids used were prepared from lard. Growth resulted, though not at a normal rate. Glycerol did not alter appreciably the rate of growth.

Diets extremely poor in carbohydrate, with low protein and high fat content.—In diets of this nature the high energy value of the fat limited the total consumption to such an extent that growth was not secured when more than 80 or 90 per cent of the calorie intake was represented by fat. The most successful diet in this series consisted of meat residue 20, beef fat 61, butterfat 14, and salt mixture 5 per cent, with vitamin B in the form of tablets consisting of 2 parts of the Osborne-Wakeman yeast fraction II and casein 8 parts.

These experiments are thought to indicate that "in as far as carbohydrate is required for the intermediary metabolism, particularly for the metabolism of fats and the development of energy in muscular contraction, it can be furnished endogenously throughout the period of growth to adult size."

Animal calorimetry.—XXIV, Analysis of the oxidation of mixtures of carbohydrate and fat, G. Lusk (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 41, 42*).—This continuation of the series of papers previously noted (E. S. R., 51, p. 265) consists of a correction of certain errors in an earlier table on the analysis of the oxidation of mixtures of carbohydrate and fat (E. S. R., 28, p. 866).

The metabolism of carbohydrates.—III, The absorption of glucose, fructose, and galactose from the small intestine, J. A. Hewitt (*Biochem. Jour., 18 (1924), No. 1, pp. 161–179*).—In this continuation of the investigation previously noted (E. S. R., 47, p. 62), the rate of absorption from the intestine of glucose, fructose, and galactose in hypotonic solution was tested in rats and cats.

When the intestinal epithelium was destroyed all three sugars were absorbed at the same rate, but when the intestinal wall was normal glucose was absorbed more readily than galactose, and galactose more readily than fructose. It is suggested that the greater toleration of fructose than of glucose in the diabetic organism may be due to its more gradual absorption.

Insulin, J. J. R. MACLEOD (*Physiol. Rev., 4 (1924), No. 1, pp. 21–68, figs. 7*).—This review deals more particularly with investigations conducted at the author's laboratory and elsewhere upon the effects of insulin on normal animals and on animals rendered hyperglycemic by other means than pancreatectomy and the possible physiological mechanism of its action. A brief summary is also given of the principal sources of insulin and of the chemistry of insulin and insulin-like substances.

A discussion, with experimental data, is first given of the effect of insulin on the blood sugar and glycogen reserves in the three forms of experimental hyperglycemia—nervous, asphyxial, and toxic. This is followed by a discussion of the effect of insulin on the blood sugar of normal animals under the following headings: "(1) The nature of the symptoms and the physiological mechanism of their production, (2) the relationship of the symptoms to the blood sugar level and their removal by raising this, and (3) the physiological factors which influence the rates of decline and of recovery of the blood sugar." The principal points brought out in explanation of the action of insulin are summarized as follows:

"The outstanding facts are that insulin causes the sugar of the blood (and tissues) to diminish both in the normal and diabetic animal, partly because of an increase in the relative amount of carbohydrate that is metabolized and partly because some of the glucose is converted into nonsaccharin material, which is mainly glycogen in diabetes but is some other substance in the normal animal. In the latter case insulin actually causes the glycogen stores to become depleted because of the demand for glucose which it sets up, partly to form this unknown substance and partly to be oxidized. We fail to identify the substance because it has lost the reducing properties upon which the identification of sugars depends and, at the same time, is not precipitated by alcohol as glycogen after treatment of the tissue with caustic alkali."

In reviewing the various sources from which insulin has been prepared, the outstanding feature is considered to be the evidence that insulin is exclusively a secretion of the islet tissues. The physiological properties which typical insulin should exhibit are stated as follows: "When given to normal animals (rabbits), it should cause immediate reduction of the blood sugar, and when hypoglycemic symptoms supervene these should be immediately and permanently removable by injections of glucose. When given to diabetic (depancreatized) animals the symptoms (hyperglycemia, glycosuria, acetonuria) should immediately disappear and the general condition greatly improve, and when carbohydrate is also given R. Q. should rise decidedly and glycogen be deposited in the liver."

A bibliography is appended.

The nature of control of the metabolism of carbohydrates in the animal body, J. J. R. MACLEOD (*Brit. Med. Jour., No. 3289 (1924), pp. 45–49*).—The subject matter of this Cameron prize lecture, delivered before the University of Edinburgh, October 16 and 17, 1923, is included in the paper noted above.

The effect of insulin on the metabolism of normal dogs, J. J. R. MACLEOD and F. N. ALLAN (*Roy. Soc. Canada Proc. and Trans., 3. ser., 17 (1923), Sect.*

V, pp. 47–55).—To test the possibility that insulin, through causing increased combustion of carbohydrates, may exert a protein-sparing action comparative observations were made on the nitrogen balance of a dog during insulin treatment (1) when fed meat alone and (2) when fed a mixture of meat and oatmeal. Determinations were also made of the acid-base balance and the creatin-creatinin excretion.

On the days in which insulin was given in connection with the first diet a marked reduction occured in the urea, creatin, and total nitrogen, with a slight increase in ammonia and no change in creatinin. On the day following the insulin administration the excretion of nitrogen and urea was still subnormal, but on the third day the nitrogen had returned to normal. No change took place in the acid-base balance.

On the mixed diet insulin did not cause any significant changes in protein metabolism, but there was evidence that acid substances were liberated.

The influence of insulin on glycogen formation in normal animals, N. A. McCormick and J. J. R. Macleod (*Roy. Soc. Canada Proc. and Trans., 3. ser., 17 (1923), Sect. V, pp. 63–73*).—A comparative study of the glycogen content of the liver, heart, and muscle tissues of normal, carbohydrate-fed rabbits with and without insulin injections is reported, with the following results:

"Taking the results as a whole, there is no evidence that injection of insulin into normal animals causes any significant change in glycogen formation, except possibly that it causes more glycogen to be deposited in the heart. In so far as the liver is concerned insulin injections usually cause less glycogen to be deposited than in control animals given the same amount of carbohydrate. This may be related to the condition of muscular excitability, which is an early symptom of overdosage.

"These results are in striking contrast to those obtained by feeding glucose to diabetic animals injected with insulin, and we conclude that the difference is due to the fact that normal animals can at all times release from the pancreas a sufficient supply of insulin to metabolize or polymerize whatever amounts of carbohydrate may be present in the body. In other words, the endogenous insulin supply is always at an optimum, so that added insulin, as by injecting it, does not have any effect in causing increased glycogen formation. In the diabetic organism, on the other hand, no insulin being available from endogenous sources, its administration from without is immediately followed by glycogen formation. Finally, there is no evidence in this investigation that the rapid disappearance of blood sugar caused by insulin in normal animals is due to glycogen formation."

The use of insulin in private and panel practice, E. P. Poulton (*Brit. Med. Jour., No. 3294 (1924), pp. 261–266, figs. 3*).—In the author's system for the dietary control of diabetes in connection with insulin treatment, the basal requirement of the patient is calculated from Dreyer's table (E. S. R., 47, p. 164), using, however, the predicted weight for body length instead of the actual weight. The protein content of the daily diet is 0.5 gm. per pound of predicted body weight. During the period of adjusting the insulin dose, no other carbohydrate is allowed than that contained in 5 per cent vegetables, but these are allowed ad libitum. The remaining calories are given as fat. Attention is called to the necessity of increasing the calorie value by 10 or 20 per cent as soon as the patient begins to take exercise. The protein is not altered, but the additional calories are given in the form of butter and cream.

Outbreaks of botulism at Albany, Oreg., and Sterling, Colo., February, 1924, F. D. Stricker and J. C. Geiger (*Pub. Health Rpts. [U. S.], 39 (1924), No. 14, pp. 655–663*).—Reports are given of two outbreaks of botulism, both of which were traced to string beans home-canned by the cold-pack process and served without reheating. The first outbreak occurred at Albany, Oreg., and involved 12 persons with 12 deaths. In the second outbreak at Sterling, Colo., there were 7 cases with 5 deaths.

Calcium in man; its normal metabolism and its perversions [trans. title], M.-P. WEIL and C.-O. GUILLAUMIN (*Rev. Path. Compar., 23 (1923), Nos. 232, pp. 440–445; 233, pp. 457–481*).—This is a review and discussion of the literature on calcium metabolism under normal and pathological conditions. Numerous literature references are given as footnotes.

The metabolism of sulphur.—VI, The oxidation of cystin in the animal organism, H. B. LEWIS, H. UPDEGRAFF, and D. A. MCGINTY (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 59–71*).—In order to obtain further evidence concerning the factors involved in the oxidation of the sulphur fraction of cystin, a similar study to the one noted in the previous paper of the series (E. S. R., 48, p. 464) was made of the behavior of another derivative of cystin, dibenzoylcystin, in which the amino group is protected from deamination by conjugation with the benzoyl group. Data are also reported on the extent of the conversion of cystin to cystein by the organism in the case of phenyluraminocystin and dibenzoylcystin. As in the previous study, rabbits were used as experimental animals.

Following the subcutaneous injection of dibenzoylcystin, the extra sulphur eliminated was almost entirely in the unoxidized sulphur fraction of the urine. After feeding dibenzoylcystin, the increase in the extra sulphur eliminated was divided between the total sulphate sulphur and unoxidized sulphur fractions of the urine. These results are thought to indicate that the oxidation of the sulphur can not take place normally if deamination is prevented, and that in the case of feeding the compound, some of the benzoyl groups were split off in the alimentary tract, with subsequent normal oxidation of the liberated cystin. After the administration of phenyluraminocystin, about half of the portion which was recovered in the urine was found to be a cystein derivative and half a cystin derivative. Similar results were obtained with dibenzoylcystin. It is thought that this conversion of cystin to cystein occurred in the organism and not in the urine after its secretion.

Wildiers' bios, W. L. MILLER (*Science, 59 (1924), No. 1522, pp. 197–199*).—A brief summary is given of studies on bios which are being conducted at the author's laboratory. These have shown that bios is not a single substance, but consists of two or possibly three contituents. As a source of the material, the tips of growing rootlets of barley, known as malt-house combings, were used. An infusion of these combings is said to yield about half the bios of an equal volume of wort with only one-sixth of the total solids, about half of which can be removed by alcohol precipitation. On treating the alcohol-purified solution with barium hydroxid, part of the active substance remains in the precipitate and part of the filtrate. Neither is active alone, but when brought together the original activity is restored. The part carried down by the barium hydroxid is provisionally named Bios I and the other Bios II.

Bios I is not adsorbed by charcoal nor removed from aqueous solution by shaking with yeast. It is not precipitated by a solution of lead acetate, but is precipitated if ammonia in excess is added to this mixture and can be dissolved again by treatment with carbon dioxid. Bios II is adsorbed by charcoal and can be removed from solutions by shaking with yeast. It is soluble in acetone and can be separated from most of the impurities present in the crude solution by concentration and extraction with acetone.

A study of the distribution of both forms of bios in about 50 grains, vegetables, fruits, and other food materials has shown that in most of the materials tested Bios I is present in physiological excess. A few materials, including mushrooms, egg white, and malt combings, contain an excess of Bios II. Barley grains were found to contain an excess of Bios II before sprouting and an excess of Bios I after sprouting. Corn showed an excess of Bios I before and after sprouting, but there was an increase in the Bios II on sprouting.

Tests with polyneuritic pigeons and with rats fed on a B-free diet gave negative results for both fractions alone and combined.

A concentrated preparation of Bios I has been made from tea dust. An infusion of this is freed from tannin by lead acetate and from Bios II by charcoal and is then precipitated by lead acetate and ammonia and the Bios I recovered by carbon dioxid. On adding methyl alcohol to the concentrated solution, two inactive crystalline substances are precipitated, while from the filtrate, after evaporation and heating to 105° C., a colorless hygroscopic residue is obtained which contains nearly all of the Bios I of the original tea. In recent work on the purification of Bios II it is reported that it has been separated into two constituents, thus indicating that Wildier's bios consists of at least three separable constituents, all of which are necessary for the normal reproduction of the yeast.

The natural distribution of Bios I and Bios II, E. V. Eastcott (*Roy. Soc. Canada Proc. and Trans., 3. ser., 17 (1923), Sect. III, pp. 157, 158*).—A summary is given of the distribution of Bios I and II in various materials, as noted in the above paper. The amount of Bios I was determined by measuring the yeast crop obtained after 24 hours at 25° C. in a culture medium containing 1 cc. of an extract of the substance under investigation, 1 cc. of a preparation of Bios II, and sufficient 10 per cent sugar solution, salts, and yeast suspension to bring the volume to 10 cc. and the initial count to 1. Bios II was determined in the same way with the use of 1 cc. of a preparation of Bios I in place of Bios II.

Bios I and II were found in approximately equivalent amounts in lemon, tomato, potato, beet, spinach, ginseng, tobacco, barley, bran, flaxseed, and egg yolk. A large excess of Bios I was found in chlorophyll, turnip, rhubarb, orange, strawberry, grape, pollen, corn, polished rice, cottonseed meal, alfalfa, hyacinth bulb, hyacinth roots, malt, malt extract, catnip, tea, macaroni, molasses, insulin, cinchona, buttermilk, pancreas, heart, and thymus. A large excess of Bios II was found in rice polishings, mushroom, coffee, malt combings, egg albumin, and liver. Very small quantities of Bios I and II were found in agar, rice starch, tapioca, sago, honey, manure water, bone meal, soil from grass plat, saliva, casein, and adrenalin hydrochlorid. Horse-radish, onion, and kidney proved toxic to yeast in the presence of wort.

Further contributions to the knowledge of organic foodstuffs with specific action, XXVI, XXVII [trans. title] (*Pflüger's Arch. Physiol., 198 (1923), No. 5–6, pp. 571–589, figs. 3*).—In continuation of the series of studies previously noted (E. S. R., 49, p. 766), two papers are presented.

XXVI. E. Abderhalden (pp. 571–582).—Experiments are reported confirming the work of Boyenval (E. S. R., 49, p. 261) that histamin, and of Lipschitz (E. S. R., 49, p. 462) that tyramin, when injected parenterally, relieve temporarily the symptoms of polyneuritis in rice-fed pigeons.

XXVII. *Experiments on geese.—Proof of the behavior of cellular enzyms*, E. Abderhalden and E. Wertheimer (pp. 588–589).—To test the enzymic action of organs of polished rice-fed birds, geese were used on account of the larger size of their organs. The geese responded to polished rice feeding in the same way as pigeons. The organs of the polyneuritic geese did not differ from those of normally fed geese in diastase, but there was a marked reduction in polypeptidase. The latter is thought to be associated with starvation rather than with the lack of antineuritic vitamin.

Further contributions to the knowledge of organic foodstuffs with specific action, XXVIII [trans. title], E. ABDERHALDEN and E. WERTHEIMER (*Pflüger's Arch. Physiol., 199 (1923), No. 3, pp. 352–364, fig. 1*).—This continuation of the series noted above constitutes another attempt to refute the hypothesis of Hess that the symptoms of avian polyneuritis are similar to those of poisoning with hydrocyanic acid (E. S. R., 47, p. 168). The arguments advanced are summarized as follows:

The lowered tissue respiration in pigeons on polished rice is concerned with a disturbance of a part of the processes of oxidation and reduction. It is not a question of a deficit of enzyms concerned with reduction, but rather of a disturbance in certain conditions indispensable to their activity. The addition of heated extracts of yeast and muscle causes the reappearance of the reduction process. The tissues, prticularly the muscle tissue, of polyneuritic pigeons behave similarly to washed tissue. The reduction process is diminished and can be retored by the heated extracts, except when they come from the organs of polyneuritic pigeons. The heated extract of yeast and, to a less degree, of muscle tissue exerts a favorable effect upon polyneuritic symptoms on injection.

Further contributions to the knowledge of organic foodstuffs with specific action, XXIX [trans. title], E. ABDERHALDEN (*Pflüger's Arch. Physiol., 201 (1923), No. 3–6, pp. 416–431, figs. 7*).—The author here groups accessory food factors or vitamins into three classes, growth factors, respiration factors, and maintenance factors. The experiments reported deal with the so-called maintenance factors, and consist of feeding trials with pigeons on polished rice supplemented by various substances to prevent the loss in weight from the rice alone. These include yeast, wheat germ, and autolyzed yeast, the latter both in its natural state and divided into portions soluble and insoluble in hydrochloric acid. Neither of these fractions alone nor the two combined proved capable of supplementing the polished rice to the extent of maintaining constant weight. The opinion is advanced that the antiscorbutic vitamin may also belong to the class of maintenance factors, and feeding experiments conducted on guinea pigs with unheated and heated vegetables are reported as supporting this theory.

Further contributions to the knowledge of organic foodstuffs with specific action, XXX, XXXI [trans. title], E. ABDERHALDEN and E. WERTHEIMER (*Pflüger's Arch. Physiol., 202 (1924), No. 3–4, pp. 395–409, figs. 6*).—In the first of these two papers the effect of vitamin B on the oxidative processes of the body was tested on the muscle tissue of pigeons by the Barcroft direct method, and the results were compared with those obtained by the indirect *m*-dinitrobenzol method, as used by Hess (E. S. R., 47, p. 168). The results were much more marked and striking by the direct than by the indirect method, and it is concluded that the latter is unsuitable for following quantitatively the total cellular respiration.

The second paper (No. XXXI) is essentially an amplification of the study reported in the seventeenth paper of the series (E. S. R., 48, p. 558).

Dietary requirements for reproduction, I, II, B. SURE (*Jour. Biol. Chem., 58 (1924), No. 3, pp. 681–709, figs. 19*).—Two papers are presented.

I. *The nutritive value of milk proteins from the standpoint of reproduction* (pp. 681–692).—This paper reports an attempt to determine whether the failure in reproduction noted in rats fed diets supposedly adequate in salts and in fat-soluble and water-soluble vitamins and with milk as a source of protein can be overcome by the addition of some amino acid or acids.

When milk proteins fed at a level of 11.9 per cent were fortified with 8 per cent of casein, arachin, or edestin in the presence of 0.4 per cent cystin, there was no improvement in fertility or any success in rearing the young. The addition of lysin or prolin to the diets of female rats during the breeding period was also without success. Partial success in reproduction was secured with 17.5 per cent of milk protein fortified with 8 per cent gelatin in the presence of 0.4 per cent cystin, but evidence on this point was not conclusive.

Success in reproduction was not obtained by increasing the total quantity of protein to 32 per cent, 12 per cent being derived from skim milk powder and 20 per cent from wheat gluten in the presence of a liberal amount of the vitamins and a suitable salt mixture. It is concluded that lack of fertility and failure to rear the young on milk diets must be attributed to a dietary factor other than protein, vitamin A (including the antirachitic vitamin), and vitamin B.

II. *The existence of a specific vitamin for reproduction* (pp. 693–709).—In a further attempt to determine the cause of the infertility noted above, it was found that fertility could be secured on a ration consisting of Georgia velvet bean pod meal 40, casein 9, salts 4, cod liver oil 2, and dextrin 45 per cent, the dextrin carrying an alcohol extract of 10 gm. of ether-extracted wheat embryo. Better success in rearing the young was obtained when the extract from 20 gm. of wheat embryo was used. Since the amount of velvet bean meal in the above ration furnished only as much vitamin B as that contained in an alcohol extract of 15 gm. of wheat embryo, the entire amount of vitamin B contained in the ration would be the equivalent of the extract of 25 gm. of wheat embryo. As no success in rearing the young resulted on a ration containing the alcoholic extract of 40 gm. of wheat embryo in the presence of adequate proteins, it is concluded that the velvet bean contains a new unidentified factor influencing reproduction.

Evidence was also obtained of the presence of this factor, which is considered to be identical with the substance X of Evans and Bishop (E. S. R., 51, p. 167), in polished rice, yellow corn, rolled oats, and lettuce. The fact that the velvet bean pod meal had been subjected to autoclaving for 1.5 hours at from 15 to 18 lbs. pressure is thought to indicate that this new factor is stable to heat. It is suggested that the term vitamin E be adopted to represent the factor influencing reproduction.

Feeding experiments in connection with vitamins A and B, V–VII, A. D. STAMMERS (*Biochem. Jour., 18 (1924), No. 1, pp. 9–15, figs. 2*).—In continuation of previous studies (E. S. R., 48, p. 862), three papers are presented.

V. *Orange juice as a source of vitamin B.*—As judged by feeding experiments involving 8 rats on a diet in which 10 cc. of orange juice was the sole source of vitamin B and 8 controls which received 2 cc. of marmite in addition to the basal diet, 10 cc. of orange juice proved insufficient to maintain weight, although sufficient to prevent the clinical symptoms of vitamin B deficiency.

VI. *Ophthalmia in rats affected with avitaminosis.*—Data are given on the development of xerophthalmia among 100 rats, 44 of which were fed a fat known to have been freed from vitamin A by steam distillation (E. S. R., 46, p. 256) and the remaining 56, fats containing varying amounts of vitamin A. Of the 44 on the totally deficient diet, 40 were young animals (from 33 to 49 days old) at the beginning of the experiment, and of these 35 developed ophthalmia between the thirty-fifth and eightieth day. The remaining 4 were

145 days old at the beginning of the experiment, and they all developed ophthalmia between the one hundred and fourth and one hundred and twenty-ninth day. Of the 56 on the partially deficient diet only 24 were affected, and these between the thirty-fifth and ninety-eighth day. In the first group 31 of the 39 affected animals died and in the second 12 of the 24.

It is concluded that the susceptibility of the animals and the time of incidence of the disease varies directly with the amount of vitamin A in the ration, and that susceptibility is modified by the age of the animals, adult animals being less susceptible than young animals.

VII. *The vitamin content of cod liver oil and malt extract.*—A comparison is reported of the value as a source of vitamins A and B of a commercial preparation of cod liver oil and malt extract and a mixture of cod liver oil and malt to which was added an emulsion of yeast and some neutralized lemon juice. The commercial preparation gave satisfactory growth when fed in 1.5-gm. amounts daily, but growth was improved by the addition of yeast and lemon juice. This is attributed to the increase in vitamin B supplied by the yeast.

The pathogenesis of certain vitamin deficiency disorders (*Jour. Amer. Med. Assoc., 82 (1924), No. 14, p. 1124*).—An editorial discussion, with particular reference to the paper of Dragstedt and Cooper (E. S. R., 50, p. 858).

The question of vitamins.—I, The lipo-soluble factor [trans. title], H. SIMONNET (*Bul. Soc. Chim. Biol., 5 (1923), No. 7, pp. 539–689, figs. 27*).—A very complete summary is given of the literature on vitamin A, including the various vitamin A-deficient diets used in different laboratories, the physiological effects of lack of vitamin A, methods of testing for its presence, and its physical and chemical properties and occurrence. An extensive bibliography is appended.

On the properties of certain South African oils with respect to their content of vitamin A, E. M. DELF (*Biochem. Jour., 18 (1924), No. 1, pp. 93–100, figs. 5*).—Using the method developed by Drummond and Coward (E. S. R., 44, p. 764), the author has determined the vitamin-A content of several South African vegetable and animal oils with the following results:

Sesame, mafurreira, and castor oils were found to have no appreciable amounts of vitamin A. Two samples of seal oil, when fed at a 10 per cent level, brought about the renewal of growth in rats on the deficient diet. Of three samples of crude whale oil, one prepared by boiling with steam at atmospheric pressure for 10 hours proved to be about as rich in vitamin A as good quality summer butter, growth being resumed on 1 per cent of the oil. The other two samples, which were extracted at higher temperatures, gave variable results.

Sperm oil prepared from the head and blubber by heating in an open vessel ot 100° C. for about 10 hours and from the meat by heating under pressure for the same length of time showed decreasing activity in the order of blubber, meat, and head. Of the blubber oil, 3 drops, representing about 1 per cent of the diet, gave good growth; of the meat oil, this amount served for maintenance and slight growth; while of the head oil there was but slight improvement on 10 per cent.

In connection with this investigation, it was noted that when the amount of vitamin A is limited the addition of vitamin C in the form of lemon juice to the diet appears to have a beneficial effect on growing rats.

A simple diet lacking in fat-soluble A [trans. title], H. SIMONNET (*Bul. Soc. Chim. Biol., 5 (1923), No. 8, pp. 739–747, figs. 4*).—The diet recommended consists of peptone obtained by pancreatic digestion of muscle 20, sucrose 74, Osborne and Mendel's salt mixture 4, and agar 2 per cent. An extract of yeast is used as a source of vitamin B. The advantage of this diet over the ones customarily used is considered to be the absence of fat, which is difficult to free absolutely from vitamin A. Growth curves are given of rats on this ration alone and supplemented by cod liver oil, coal fish oil, and peanut oil. Peanut oil fed to the extent of 2 per cent of the ration or in 5-drop amounts proved capable of maintaining the weight, but not of inducing growth or curing xerophthalmia in the experimental animals.

The parenteral vitamin treatment of xerophthalmia [trans. title], O. Blegvad (*Ugeskr. Laeger, 85 (1923), No. 51, pp. 942, 943, fig. 1; abs. in Brit. Med. Jour., No. 3290 (1924), pp. 122, 123*).—A brief report is given of the successful treatment of xerophthalmia by subcutaneous injection of a concentrated preparation of vitimin A. The patient, a bricklayer 54 years of age, was suffering from cancer of the liver and jaundice. Although his diet had not been deficient in vitamin A, xerosis of the conjunctiva, with severe night blindness, had developed. Since no improvement resulted on a diet rich in vitamin A and there was evidence of incomplete assimilation of fats, the patient was given subcutaneous injections every other day of 1 cc. of concentrated extract of vitamin A in olive oil. After two injections the xerosis disappeared and the night blindness was less troublesome. After six injections the night blindness disappeared.

It is thought that this method of treating xerophthalmia should prove valuable in cases of impaired absorptive capacity of the intestines.

The concentrated extract used was prepared by saponifying cod liver oil with potassium hydroxid in an atmosphere of nitrogen and extracting the nonsaponifiable fraction with ether. After repeating the process once or twice, the combined ether extracts are distilled, the nonvolatile residue is dissolved in ethyl or methyl alcohol, and the cholesterol precipitated from the solution by concentration at low temperatures. After separating the cholesterol, the filtrate is dissolved in 10 times its volume of olive oil and sterilized. The preparation is said to contain about 100 times as much vitamin A as the same volume of cod liver oil.

Why xerophthalmia deserves attention (*Jour. Amer. Med. Assoc., 82 (1924), No. 13, pp. 1048, 1049*).—This editorial discussion of the reports by Bloch on the occurrence of xerophthalmia among the children of Denmark (E. S. R., 51, p. 267) emphasizes the importance of milk as a food for children from the standpoint of its furnishing a sufficiency of vitamin A.

The influence of qualitative undernutrition on the function of the sexual glands [trans. title], A. Eckstein (*Pflüger's Arch. Physiol., 201 (1923), No. 1-2, pp. 16-24, figs. 3*).—The gonads of nine male and nine female rats from five different litters which had been reared on a rickets-producing diet low in fat, vitamin A, and phosphorus were subjected to histological examination.

The testicles showed marked atrophy, severe degeneration which extended to the interstitial cells, and no evidence of spermatogenesis. The ovaries showed no injury of function. Undeveloped eggs, ripening follicles, and corpora lutea were present in the usual number. Failure to conceive is attributed to the weakened general condition of the body.

The relation of the vitamin A potency of the liver oil to the sexual condition and age of the cod, S. S. Zilva, J. C. Drummond, and M. Graham (*Biochem. Jour., 18 (1924), No. 1, pp. 178-181*).—Tests by the method of Zilva and Miura (E. S. R., 46, p. 806) of the vitamin A potency of the liver oils of cod in different stages of sexual maturity showed no appreciable difference in potency as a result of sexual condition. The gonads of some of the same fish were tested and found to be quite rich in vitamin A, thus indicating that as the spawning period approaches the oil and the vitamin from the liver pass into the gonads without affecting the relative potency of the residual oil.

No difference was noted in the potency of the liver oil of fish of different ages. The variation in the potency of the oil obtained from cod at different times is thought to be due entirely to the food of the fish.

Vitamin B content of white bread, G. A. HARTWELL (*Biochem. Jour., 18 (1924), No. 1, pp. 120–126, fig. 1*).—The bread tested included white bread bought from a baker, homemade white bread prepared with yeast, and homemade white bread prepared with baking powder. The homemade bread contained no milk and the baker's bread was assumed to contain none. The diet of the experimental rats, one group of which was about 21 days old and weighed about 40 gm. each and another from 38 to 40 days old and weighed about 70 gm. each, consisted of bread 30, butter 3, and salt mixture 0.7 gm., moistened with 60 cc. of water. In nearly all of the tests 6 males and 6 females of about the same age and size were used for each type of bread.

On the above ration the animals grew at a slow but fairly regular rate, the males less than the females. Litters were produced, and some of the young were raised. The animals on the baking-powder bread did dot grow so well as on the yeast breads. In a few experiments with baker's bread and water alone there was slow growth throughout a period of 21 days. On supplementing the first diet with wheat germ extract there was slight improvement in growth, particularly in the males.

The author concludes that "white bread contains sufficient vitamin B to supply the needs of the rat, both for growth and reproduction. On a diet of white bread, butter, salt mixture, and water, the growth is slow but continuous. This slow growth is probably due to deficiency in the quality and quantity of the protein."

The effect of fasting (and refeeding) on the calcium and inorganic phosphorus in blood serums of normal and rachitic rats, A. W. CAVINS (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 237–242*).—This paper reports a comparison of the concentrations of calcium and inorganic phosphorus in the serums of rachitic and normal rats at the end of varying periods of fasting. In the case of the rachitic rats, determinations were also made after they had again been placed after fasting on the rickets-producing diets.

In both the normal and rachitic rats fasting induced a sharp rise in the level of the inorganic blood phosphorus, with a corresponding fall in the calcium content. In the rachitic animals returned to the rickets-producing diet after fasting the phosphorus again fell to the low amount of the rachitic condition and the calcium increased to values above normal.

Studies on experimental rickets, XXIV, XXV, P. G. SHIPLEY, E. M. KINNEY, and E. V. MCCOLLUM (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 165–182*).—Continuing the series of studies previously noted (E. S. R., 48, p. 761), two papers are presented.

XXIV. *The effect of certain extracts of plant tissues on florid rickets* (pp. 165–175).—Ether and alcohol extracts of various vegetable tissues were tested for antirachitic vitamin by observing whether they initiated healing (as observed by the line test) in the bones of rats made rachitic by a standard rickets-producing diet consisting of maize 33, wheat 33, wheat gluten 15, gelatin 15, sodium chlorid 1, and calcium carbonate 3 per cent.

Ether, alcohol, and acetone extracts of alfalfa leaves in amount corresponding to 250 gm. of alfalfa meal per kilogram of food caused healing of rickets, beginning before the seventh day and being practically complete in 33 days. Alcohol extracts of alfalfa which had previously been extracted with ether did not induce healing of rickets, thus showing that ether extracts the active substance completely. Ethyl acetate did not extract completely the antirachitic substance. Extracts of alfalfa meal with boiling water also proved antirachitic. The ether extracts proved to be free from calcium and to contain only insignificant traces of phosphorus.

Positive results were obtained with ether extracts of clover blossoms and negative results with ether extracts of dry spinach, Brussels sprouts, cabbage, celery, tomato, and sweet potato when given in amounts equivalent to 250 gm. per kilogram of ration. "The healing of rickets which follows the administration of extracts of alfalfa or clover can not be due to phosphorus or to the abstraction of calcium from the food by its precipitation in the intestine in the form of insoluble soaps of the therapeutic agent."

XXV. *A study of the antirachitic effect of certain oils* (pp. 177–182).—Using the methods of the above study, various oils were tested for antirachitic properties with the following results:

Negative results were obtained with sandalwood oil, lemon oil, orange peel oil, palm oil, the fraction of butterfat insoluble in alcohol, Japan wax, spike oil, fennel seed oil, spermaceti, and sperm oil. Oil of cloves proved remarkably active, 2 per cent being sufficient to initiate prompt recalcification of the bones. Compared with this, 3 per cent of alcoholic extract of butterfat had to be administered for a relatively long period before marked signs of healing occurred. When the butter oil was fed to the extent of 10 per cent of the ration, the animals showed advanced healing after 11 days.

A note on the conservation of the potency of concentrated antiscorbutic preparations, II, S. S. Zilva (*Biochem. Jour., 18 (1924), No. 1, pp. 186, 187*).—Decitrated lemon juice, prepared as described in the previous note (E. S. R., 49, p. 806), was concentrated to one-tenth its volume, acidified by the addition of 7 gm. of citric acid to 1 liter of juice, and placed in 50-cc. amounts in a series of flasks, which were then evacuated and sealed. After storage under laboratory condition in a dark cupboard for 3 and 5 months, respectively, the flasks were opened and the juice tested for antiscorbutic properties after being diluted to its original volume. No loss in potency could be detected at either period.

The concentrated product was also used after 6 months' storage in the treatment of a severe case of infantile scurvy. The treatment was very intensive, from 2.5 to 6 dr. being given every 3 hours during the first 2 days and 1 dr. every 6 hours on the following day. Since 1 dr. of the concentrated juice was the equivalent of the juice of 1 lemon, the equivalent of about 15 lemons was given during the first 24 hours. The patient was discharged cured in 10 days, during which time the equivalent of about 48 lemons had been administered.

The catalytic action of minute amounts of copper in the destruction of antiscorbutic vitamin in milk, A. F. Hess and M. Weinstock (*Jour. Amer. Med. Assoc., 82 (1924), No. 12, pp. 952–956, figs. 4*).—In this extension of previous studies (E. S. R., 46, p. 865), the effect was determined of very small amounts of copper on the antiscorbutic vitamin of milk during the process of drying. The copper was added as copper lactate to the milk before drying. The dried milk containing the copper and milk dried at the same time without copper were fed groups of guinea pigs in daily amounts of 70 cc. per capita.

In the first series, in which the copper was added to the extent of 9 parts per million of the reconstituted milk, 1 of the 8 controls and 10 of the 14 on the copper-containing milk developed scurvy. In further experiments, in which 6 and 2.5 parts per million, respectively, of copper were added in the same way, 4 of the 5 animals in the first group and 5 of the 6 in the second developed scurvy. It is pointed out that the amount of milk fed was not sufficient to prevent latent scurvy even in the controls. With this in mind, it is considered that the presence of copper to the extent of 2.5 parts per million is sufficient to destroy an appreciable amount of the antiscorbutic vitamin of the milk.

The bearing of this on the question of commercial pasteurization is discussed, reference being made to published reports on the amount of copper found in milk heated industrially. The conclusion is drawn that "under ideal industrial conditions, such as obtain in modern, well equipped, and properly supervised plants, the danger is not great of the contamination with copper being sufficient to lead to a significant destruction of the antiscorbutic vitamin. On the other hand, it is probable that with the increase of pasteurization throughout the United States the normal 0.5 mg. of copper per liter is at times raised by means of contamination to 2.5 mg. per liter, a percentage which our investigation has demonstrated leads to a considerable destruction of this vitamin. It should be borne in mind that these experiments have not determined the minimum amount of copper necessary to bring about a partial destruction of this factor. It is possible, if not probable, that less than 2.5 mg. has a deleterious effect, for it is unlikely that destruction should suddenly begin just at the ratio which we arbitrarily selected."

Attention is also called to the possibility of a similar destruction of vitamin A in butter and cream.

Some further observations concerning the antiscorbutic requirement of the rat, H. T. Parsons and M. K. Hutton (*Jour. Biol. Chem., 59 (1924), No. 1, pp. 97–105, figs. 2*).—In the work reported in this paper an effort was made to obtain a ration more nearly free from vitamin C than the one used in the previous study by the senior author (E. S. R., 44, p. 862), and the feeding of the livers of the animals on the highly purified diet was continued for a longer time. Two successive generations of rats were raised on the vitamin C-deficient diet without noticeable diminution in the concentration of vitamin C in their livers. This is thought to disprove one of the hypotheses advanced in the previous report, namely, that "the rat has a very definite food requirement for the antiscorbutic factor, but this is quantitatively very small in comparison with the requirement of the guinea pig and can be met by certan diets very low in this factor on which the guinea pig acquires pronounced scurvy."

ANIMAL PRODUCTION.

Scientific feeding of the domestic animals, M. Klimmer, trans. by P. Fischer (*Chicago: Alexander Eger, 1923, 3 ed., rev. and enl., pp. X+242, figs. 94*).—This is an English translation of the book previously noted (E. S. R., 46, p. 70).

Factors in live stock experimental work, J. P. Sackville (*Sci. Agr., 4 (1924), No. 7, pp. 210–212*).—This is a brief review of the nature of the livestock experiments being conducted at the University of Alberta, with reference to the difficulties encountered and the limitations to the results of experiments with animals.

The biological value of proteins at different levels of intake, H. H. Mitchell (*Jour. Biol. Chem., 58 (1924), No. 3, pp. 905–922*).—The biological values of different proteins, as determined by the method described in the paper previously noted (E. S. R., 51, p. 407), have been determined for rats receiving rations containing approximately 5 and 10 per cent of protein as follows: Five per cent protein rations, milk 93.4, casein 70.8, corn 72, oats 78.6, rice 86.1, potato 68.5, and yeast 85.5, and on a 10 per cent protein level, milk 84.7, corn 59.6, oats 64.9, potato 66.7, steam-cooked navy bean 38.4, and tankage 31.5.

The differences in the biological values of the proteins at the two levels are discussed, from which it is concluded that the protein utilization for maintenance is more economical than for growth. The nitrogen intake and outgo of six rats fed on rations containing different percentages of protein and fed from one to six times daily indicated that the utilization of nitrogen was unaffected by the number of feedings daily at the lowest level of nitrogen intake (1.048 per cent), but there was a higher utilization of nitrogen with several feedings per day at the highest level of nitrogen intake (2.992 per cent). This partially supports the theory that the rate of influx of amino acids to the tissues inversely affects the economy of nitrogen utilization.

The supplementary relations among proteins, H. H. Mitchell (*Jour. Biol. Chem., 58 (1924), No. 3, pp. 923–929*).—The results of experiments dealing with the biological values of combinations of proteins, as determined on a 10 per cent level with rats, indicate a distinct supplementing action of the proteins of cystin and casein, milk and corn, and tankage and corn. These experiments indicated an average biological value of 75.7 for protein consisting of 75 per cent corn and 25 per cent milk protein, whereas the value of the former alone has been calculated as 61.3 and the latter 84.7, making the weighted estimated value of the mixture 67.2. A more striking example was in the ration in which the protein was derived equally from corn and tankage, the average biological values of the individual proteins being 61.3 and 31.5, respectively. In this combination the biological value of the protein was determined as very close to 60 in five of six rats. In another test no supplementing action was demonstrated between gelatin and oat proteins.

True protein versus crude protein as a basis for computation of feeding standards, E. B. Forbes (*Jour. Dairy Sci., 7 (1924), No. 2, pp. 154–159*).—A discussion of the expression of proteins as crude or true proteins in feeding standards is given, from which it is concluded that since the predominant usage favors the expression of the analyses as crude proteins, practically as satisfactory results would probably be procured by continued use of this term provided that both the animal requirements and the plant constitutents are given on this basis.

The conservation of forage in silos [trans. title], I. Albertoni (*Indus. Latt. e Zootec., 21 (1923), Nos. 9, pp. 115, 116, fig. 1; 11, pp. 146, 147, 149, figs. 4*).—Different methods of preserving feeds in silos are discussed, with special reference to the production of brown hay and electrically preserved silage. Special consideration is given to the digestible nutrients, proteins, and energy in the materials preserved in the different ways.

Composition of different straws and the material derived from them after different treatments [trans. title], T. E. Blasweiler (*Papier Fabrik., 21 (1923), Nos. 26, [Ver. Zellstoff, etc.], pp. 309–311; 27, pp. 321, 322; 31, pp. 361–365; 32, pp. 373–376*).—The dry matter, cellulose, pentosan, lignin, and ash contents of oat, rye, and rape straw and oat hulls are given, and the effect on the composition of these materials by treating them with and without pressure, cold and cooked, with caustic soda, caustic lime, soda, sodium sulphid, and sodium sulphite is discussed and tabulated. In general the lignin resisted the action of most of the chemicals used, but the pentosans were more completely dissolved. Sodium hydroxid seemed to produce the best solution of the lignins. A comparison of the alkali and acid-forming materials used in the treatment showed that in the alkali treatments with sodium hydroxid there was a greater amount of the lignins and ash lost, with a good yield of the cellulose and pentosan, but with the acid treatment, as with sodium bisulphid, there was less dissolving of the lignins but a greater loss in pentosan.

Commercial feeding stuffs, E. G. Proulx et al. (*Indiana Sta. Bul. 278* (*1924*), *pp. 23, fig. 1*).—This bulletin gives a summary of the official inspections of feeding stuffs in the State during 1923, as well as other information of practical value, including instructions for calculating the composition of a mixed feed when the composition of the ingredients is known. The previous report was noted (E. S. R., 49, p. 771).

Fifth annual report division of feed inspection for the year 1923, H. A. Halvorson (*Minn. State Dairy and Food Comn., Div. Feed Insp. Ann. Rpt., 5* (*1923*), *pp. 173, fig. 1*).—This is the usual report (E. S. R., 51, p. 374) of the guaranteed and found analyses of the samples of feeding stuffs officially inspected in Minnesota during 1923, with other miscellaneous information, including a list of the brands of feed listed for sale on January 31, 1924.

Steer feeding experiments, 1922–1923, C. W. Hickman and E. F. Rinehart (*Idaho Sta. Circ.* [*32*] (*1923*), *pp. 4*).—In continuing the steer feeding experiments previously noted (E. S. R., 48, p. 569), the comparative value of whole and chopped alfalfa hay and the value of adding limited amounts of barley, corn, and corn silage to the alfalfa ration have been studied, using 8 lots of 10 steers each in a 100-day test. The amounts of hay fed were determined by the appetite. The results of the experiments, giving the rations fed to each lot, are summarized in the following table:

Summary of steer feeding experiments, 1922–23.

Lot.	Average daily ration per 1,000 lbs. live weight.	Average initial weight.	Average daily gain.	Feed per 100 lbs. gain.			Appraised value per 100 lbs.
				Alfalfa.	Corn silage.	Grain.	
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	
3	Long alfalfa hay and 5 lbs. corn	1,025.26	1.61	1,788.5		319.1	$6.25
4	Long alfalfa hay and 5 lbs. ground barley	1,012.40	1.69	1,685.1		295.3	6.25
5	Cut alfalfa hay and 5 lbs. ground barley	978.07	1.56	1,644.2		313.6	6.00
6	Long alfalfa hay	985.37	1.17	2,718.1			6.00
7	Long alfalfa hay and 15 lbs. corn silage	998.40	1.22	2,198.4	1,177.4		6.00
8	Long alfalfa hay and 25 lbs. corn silage	993.10	1.22	1,855.2	1,872.1		5.75
9	Cut alfalfa hay and 15 lbs. corn silage	993.60	1.25	2,156.2	1,029.8		6.00
10	Cut alfalfa hay	977.13	1.29	2,314.6			5.75

Cattle feeding investigations.—Finishing baby beef, W. L. Blizzard (*Oklahoma Sta. Bul. 147* [*1923*], *pp. 8*).—The results of two experiments in finishing baby beeves are reported, in continuation of the cattle feeding investigations (E. S. R., 47, p. 70).

The first experiment dealt with the addition of limited amounts of corn silage in lot 1, limited amounts of sunflower silage in lot 2, and a full feed of sunflower silage in lot 3 to a ration of shelled corn, cottonseed meal, and alfalfa hay. The grain ration was limited in lot 3. Lot 4 received the basal ration without silage. There were 8 calves in each lot.

In the second experiment ground kafir, ground darso, and ground barley were compared with ground corn when fed with a basal ration of cottonseed meal, sorghum silage, and alfalfa hay. Four lots of calves received the following grains: Lot 1, consisting of 7 steers, ground corn; lot 2, consisting of 8 heifers, ground kafir; and lots 3 and 4, consisting of 8 steers each, ground darso and ground barley, respectively. Hogs followed the calves in both experiments. The gains and other results are summarized in the following table:

Summary of baby beef fattening experiments.

Experiment.	Lot.	Average initial weight.	Average daily gain.	Feed required per 100 pounds gain.				Dressing percentage.	Estimated hog profits per steer.
				Corn or other grain.	Cottonseed meal.	Silage.	Alfalfa hay.		
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per cent.*	
1	1	351.25	1.79	408.84	42.93	517.56	82.41	57.1	$3.53
	2	351.25	1.52	510.73	50.09	604.30	96.22	53.7	2.80
	3	351.66	1.57	468.35	48.52	716.27	94.48	58.6	3.12
	4	349.16	1.50	469.11	48.05	----------	286.73	55.0	3.77
2	1	290.00	2.02	518.00	35.70	429.00	49.20	56.4	1.38
	2	294.00	1.84	611.00	54.50	525.00	55.80	56.2	1.80
	3	300.00	1.62	666.00	43.40	549.00	63.50	53.4	.99
	4	314.00	1.94	568.00	36.10	443.00	53.20	55.6	.47

Steer feeding experiments, G. B. Rothwell (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1922, pp. 3–5*).—One lot of 26 2-year-old steers receiving corn silage and range hay from February 2 to April 5 gained an average of 13.5 lbs., whereas another similar lot wintered on sunflower silage and hay consumed less silage and hay and lost an average of 24.2 lbs. per steer. The sunflower silage was more completely frozen than the corn silage.

The feeding of working and dairy cattle in Mauritius, R. Laval (*Mauritius Dept. Agr., Gen. Ser., Bul. 29 (1923), Eng. ed., pp. 16*).—This consists of a brief discussion of the principles of feeding working and dairy cattle, with tables giving the composition and digestibility of the more common feeds in Mauritius.

Sheep feeding investigations.—Comparative rations for fattening wether lambs, A. E. Darlow (*Oklahoma Sta. Bul. 146 [1923], pp. 7*).—The results are reported of a 44-day lamb fattening experiment in which various grains were compared with corn when fed with alfalfa hay and linseed oil meal. Five lots of 20 lambs each averaging 70 lbs. in weight were selected for the test. The average daily rations fed per lamb in all lots consisted of 1.33 lbs. of alfalfa hay, 0.128 lb. of linseed oil meal, and 1.118 lbs. of corn or its substitute. The gains per lamb made when the different grains were included were corn 11.58 lbs., kafir 11.9 lbs., darso 12.1 lbs., whole barley 10.4 lbs., and ground kafir 10.4 lbs. The development of necrobacillosis at the start of the test probably prevented larger gains. The lots sold for the same price per pound, which was less than 1 ct. more than their cost, and this resulted in financial losses from all lots. The experiment demonstrated that kafir and darso were fully equal to corn for fattening lambs, and the costs of gain were less.

[Experiments with sheep at the Fredericton Experimental Station], C. F. Bailey (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1922, pp. 18–20*).—Included in the reports of the experiments with sheep are the following:

Early versus late weaning of lambs.—One lot of lambs weaned and put on rape pasture on July 15 made average gains per lamb of 12.2 lbs. during the succeeding 30 days, whereas another lot of similar lambs left on pasture with their dams made average gains of only 7.2 lbs. During the next 30 days the early weaned lot also made better gains on rape pasture, the average being 18.2 as compared with 7.3 lbs. for the late weaned lambs on the feed. The advantage for early weaning is thus demonstrated.

Lamb fattening experiment.—One year's test indicated that it would be profitable to hold lambs over and fatten them for the Christmas trade instead of disposing of all of them in the fall and breaking the market as is customary.

[Purebred v. crossbred lambs], G. B. ROTHWELL (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1922, pp. 48, 49*).—A comparison of the lambing percentages of purebred Leicester and Shropshire and crossbred lambs of the two breeds showed that the following percentages were raised per ewe: Purebred Leicester 136, purebred Shropshire 105, Leicester ewe×Shropshire ram 123, and Shropshire ewe×Leicester ram 118. It is stated that these results indicate the better mothering qualities of the Leicester ewes.

Angora goats, C. F. BAILEY (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1922, pp. 20, 21*).—The results of three experiments in which Angora goats were employed for clearing bushes from land indicated that they are more certain to destroy poplar, birch, and maple bushes than alders, but when the bushes were 6 to 9 ft. high, the goats made little headway. The mohair produced did not bring a satisfactory price, and the long feeding period made the goats uneconomical.

Swine feeding investigations: Oklahoma feeds and how to prepare them, C. P. THOMPSON (*Oklahoma Sta. Bul. [148] (1923), pp. 15*).—The results of six experiments are summarized in which sorghum grains, corn, and different methods of feeding barley are compared for fattening swine. The results of five of these experiments have been briefly noted from earlier reports (E. S. R., 43, p. 70; 45, p. 474; 47, p. 868).

The other experiment deals with a 60-day comparison of corn and darso when hand-fed with tankage. There were 8 pigs averaging 132 and 135 lbs. in the corn and darso lots, respectively. The average gains made during the test period per pig were 93 and 87.2 lbs. In making the former gain 350 lbs. of corn and 31 lbs. of tankage were required per 100 lbs., whereas 360 lbs. of darso and 15 lbs. of tankage were required in making the latter gains. Since the darso was slightly cheaper per 100 lbs., the profits were a little greater when it was fed.

Growing pigs on alfalfa pasture, G. A. BROWN and W. E. J. EDWARDS (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 154–156*).—The results of a test are reported in which 59 pigs were pastured on 10 acres of alfalfa from May 2 to October 12. During the time from May 2 to early in July the 9 mothers of these pigs were also on the pasture. The lot was divided into two 5-acre portions which were pastured alternately. An average of 2.67 tons of hay per acre was also cut from the pasture, which was only 1.06 tons per acre less than was cut from an unpastured piece of alfalfa. It is calculated that this is an economical way to carry spring pigs until fall when grain ripens.

Rape pasture for hogs, W. E. J. EDWARDS and G. A. BROWN (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 156, 157*).—Three lots of 9 60-lb. pigs each were fattened on ⅛ acre plats of rape pasture, receiving a ration of hominy and middlings, 2:1. One lot was self-fed, making average daily gains of 1.84 lbs. per pig, and the other two lots were hand-fed different amounts of the feed, the one making gains of 1.13 lbs. and the other 0.80 lb. per day. The lot receiving the smaller amount of feed made gains with about the same feed requirements as the self-fed lot, but the lot receiving about a three-fourths full feed of grain required more grain for the gains made.

The food value of milk, O. E. REED and C. F. HUFFMAN (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 147–151, figs. 4*).—In demonstrating the feeding value of skim milk, four 2-months-old pigs averaging 36.5 lbs. in weight were selected, one-half of which were self-fed on shelled yellow corn and the other half on shelled yellow corn and skim milk. The first two pigs made average gains of 9.5 lbs. during 5 months, while the latter two pigs made average gains of 221 lbs. At the conclusion of this test one of the stunted pigs was continued on the shelled corn with the addition of skim milk and the other stunted pig received a complete mineral mixture in addition to the corn. The respective gains made in 5 months were 307 and 28 lbs. At the age of 1 year the pig receiving minerals was given skim milk during the succeeding 5 months and made a gain of 274 lbs.

The value of mineral supplements in swine feeding, J. B. Rice and H. H. Mitchell (*Illinois Sta. Bul. 250 (1924), pp. 89–110*).—The practical necessity of supplying minerals to swine is reviewed, followed by a more detailed report of the 3 years' experiments in adding minerals to well balanced rations than was previously noted (E. S. R., 49, p. 368).

Six lots of 20 pigs each, averaging 43 lbs., were selected for the first experiment, which was concerned with the advisability of adding mineral supplements to a ration of corn, middlings, and tankage, with and without rape pasture. The pigs of lots 1, 2, and 3 were hand-fed in dry lot a full ration of corn, with 0.4 lb. of tankage and 0.8 lb. of middlings. Lots 4, 5, and 6 were similarly fed on rape pasture except that the amounts of tankage and middlings were less, the former varying from 0.25 to 0.3 lb. and the latter from 0.5 to 0.75 lb. per day. Lots 1 and 4 received no mineral supplements, while the other four lots were given access in separate self-feeders to coal, limestone, rock phosphate, and salt, and in addition charcoal and air-slaked lime were supplied to lots 3 and 6.

Four lots of 20 pigs each, averaging 46 lbs. in weight, were selected for the second experiment. All lots were on blue grass pasture from July 10 to October 2, after which they were fed in dry lot. Lots 1 and 2 received a two-thirds ration of corn while on pasture, followed by full feeding in the dry lot. Lots 3 and 4 received a full ration of corn throughout and in addition 0.25 lb. of tankage per head daily. Lots 2 and 4 also had access to a mineral mixture of 5 parts of coal and 1 part each of air-slaked lime, rock phosphate, and salt.

The third experiment was conducted on blue grass pasture with two lots of 20 pigs each, averaging about 65 lbs. in weight. The average daily rations consumed by each lot were 3.4 lbs. of corn, 0.51 lb. of linseed oil meal, and 0.79 lb. of middlings. In addition lot 2 had access to a mineral mixture of 5 parts of coal and 1 part each of ground limestone, rock phosphate, and salt. The results of the three experiments are summarized in the table below, all pigs being fed to an approximate weight of 225 lbs.

The effect of mineral supplements on gains and feed consumed by swine.

Experiment.	Lot.	Average daily gain.	Feed per 100 lbs. gain.				Mineral supplements consumed daily per pig						
			Corn.	Linseed oil meal.	Tankage.	Middlings.	Coal.	Limestone.	Rock phosphate.	Salt.	Charcoal.	Air-slaked lime.	Total.
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Oz.*	*Oz.*	*Oz.*	*Oz.*	*Oz.*	*Oz.*	*Oz.*
1	1	0.89	370	-------	41	87	-------	-------	-------	-------	-------	-------	-------
	2	.95	349	-------	39	82	1.18	0.12	0.09	0.15	-------	-------	1.54
	3	.91	362	-------	40	85	.89	.18	.13	.19	0.26	0.01	1.66
	4	.98	358	-------	27	69	-------	-------	-------	-------	-------	-------	-------
	5	1.00	356	-------	27	67	2.52	.05	.07	.18	-------	-------	2.82
	6	1.01	361	-------	27	68	.99	.14	.10	.15	.31	.03	1.72
2	1	.89	448	-------	36	-------	-------	-------	-------	-------	-------	-------	-------
	2	.90	440	-------	35	-------	-------	-------	-------	-------	-------	-------	2.04
	3	.77	461	-------	32	-------	-------	-------	-------	-------	-------	-------	-------
	4	.75	450	-------	31	-------	-------	-------	-------	-------	-------	-------	2.10
3	1	.93	365	55	-------	85	-------	-------	-------	-------	-------	-------	-------
	2	1.00	338	51	-------	79	-------	-------	-------	-------	-------	-------	.88

At the conclusion of experiment 3, 5 pigs from each lot were slaughtered and the leg bones measured and analyzed. Six sows from lot 1 and 5 from lot 2 were bred and continued on their respective rations until after weaning their pigs. The measurements and composition of the bones of the slaughtered pigs did not reveal any significant differences, but the bones of the pigs receiving the minerals had a higher specific gravity and a higher ash content. The bones of the mineral-fed pigs were thus stronger and denser. The sows which were bred gained faster in the mineral-fed lot, 0.87 as compared with 0.64 lb. for the average daily gains. The litters of the mineral-fed sows were also larger and heavier, though the average weights of the pigs were less. The sows were slaughtered after weaning their pigs and an examination of their leg bones did not reveal any significant difference between the two groups.

The authors conclude from the work that the addition of minerals to well-balanced rations had little effect on the gains of the pigs receiving them.

Fattening stunted pigs, W. E. CARROLL (*Breeder's Gaz., 85 (1924), No. 8, p. 237*).—For another year's study of the effect of prolonged maintenance on the succeeding gains of hogs (E. S. R. 49, p. 872) two lots of 10 pigs each averaging 47 lbs. were selected. The one lot self-fed from the beginning gained an average of 1.53 lbs. per head daily, whereas the other lot held at maintenance for 168 days gained an average of 1.94 lbs. per head when placed on self-feeders. The pigs self-fed from the beginning also required 17 per cent more feed per 100 lbs. of gain and 25 per cent longer time to reach 200 lbs. than the other pigs. The indications of the 2 years' work are that pigs stunted from lack of feed do not lose the power to recover and make economical gains when sufficient feed is supplied.

[Swine feeding experiments at the Fredericton Experimental Station], C. F. BAILEY (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1922, pp. 22–25, fig. 1*).—The amounts of feed required by sows during the gestation period, by pigs to six weeks of age, by young sows to date of farrowing, and by aged sows and boars for one year's maintenance have been computed. In another experiment, pigs averaging about 25 lbs. in weight on July 12 were fed until November 18, first on oats, middlings, and skim milk, but with gradual changes to a finishing ration of corn or barley 2 parts, shorts 1 part, and oats 1 part, with skim milk and green feed. The gains made were about equal with corn and barley, but finishing was a little slower on the barley ration, though it is stated that the barley-fed hogs were decidedly better finished than those receiving corn.

New investigations of the early determination of pregnancy [trans. title], SCHMIDT (*Jour. Landw., 71 (1923), No. 1, pp. 1–8*).—This consists largely of a description of the interferometric method for the early determination of pregnancy. The test depends on the reaction of serum from the female animal in question to placenta preparations. The method has been successfully used in Germany with animals and also gives accurate results with humans.

The determination of early pregnancy in swine by the interferometric method [trans. title], E. WENDT (*Jour. Landw., 71 (1923), No. 1, pp. 9–13*).—The results of experiments with 100 sows at the University of Göttingen have led the author to conclude that where the tests are made four weeks after mating, negative reactions are certain indications of nonpregnancy, but positive reactions may occur as a result of pathological conditions. Pregnancy may be detected within eight days of service, but there is no regularity of determination up to four weeks, after which time pregnancy may always be demonstrated.

How early may pregnancy in swine be detected by the interferometric method [trans. title]? A. SAX (*Jour. Landw., 71 (1923), No. 1, pp. 14, 15*).—A continuation of the above experiments with 61 tests of serum from nonpregnant sows and 59 tests of pregnant sows led the author to draw conclusions similar to those of Wendt. The present investigation indicated that pregnancy could be determined accurately within two or three weeks after service.

Alfalfa and horses, R. S. Hudson (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 151–154, fig. 1*).—In comparing rations of corn and alfalfa with corn, oats, and timothy for work horses, one horse of each of nine teams of medium to heavy horses received each of the compared rations over a period of 13 weeks. The horses receiving alfalfa gained a total of 740 lbs, while those receiving timothy lost 30 lbs. The alfalfa ration was also less expensive.

Influence of vitamines on growth and resistance to coccidiosis, G. F. Heuser (*Rel. Poultry Jour., 31 (1924), No. 2, pp. 226, 228, 232, figs. 2*).—The results of experiments conducted at the New York Cornell Experiment Station are briefly reported. Five lots of about 50 day-old chicks each received the following daily supplements to a basal mash and scratch grain ration until 8 weeks of age: Lot 1 no supplement, lot 2 2 teaspoonfuls of cod liver oil, lot 3 green feed, and lots 4 and 5 2 teaspoonfuls of cod liver oil and green feed, with a further addition of skim milk in lot 5. The average weights per chick at 8 weeks of age were in the respective lots 153.6, 204.9, 177.9, 235.8, and 454.7 gm. The records of weights and losses were kept to 13 weeks of age, though the rations of all lots were the same as lot 5 after 8 weeks.

Losses of chicks from an infection of coccidiosis were heavy from the sixth to the eleventh week, but only 1 bird was lost in lot 5, as compared with 43 in lot 1, 25 in lot 2, 37 in lot 3, and 16 in lot 4. The author concludes that the vitamins supplied induced better growth and increased the resistance to coccidiosis.

Egg production and broodiness, C. M. Ferguson (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 162–168, figs. 5*).—This gives the comparative production during the winter, spring, and summer-fall periods of the birds of the different breeds in the Michigan Agricultural College laying contest, as well as a summary of the amount of broodines of each breed.

The effects of shell texture on the hatchability of hens' eggs, B. F. Kaupp (*Poultry Item, 26 (1924), No. 4, p. 12*).—A brief report is given of a study at the North Carolina Experiment Station of the fertility and hatchability of eggs having different textures of shell, classified as normal, ridged, mottled, or thin shelled. In one test in 1923 the following hatchability of eggs was found: Normal shelled 61.8 per cent, mottled 33.3, and ridged shelled 41.2 per cent, and in another test in the same year normal 54 per cent, mottled 42, thin 30, and ridged shelled 22 per cent. The following table summarizing the hatching results of 4,308 eggs of different shell textures incubated during 1922 also shows the advantage for normal shelled eggs:

Effect of shell texture on hatchability of eggs.

Texture of shell.	Fertility.	Dead germs.			Difference as compared with normal.
		7th day.	18th day.	21st day.	
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Normal	85.1	7.5	8.4	18.1	
Ridged	54.9	18.0	20.0	47.7	30.2
Mottled	38.5	22.7	20.6	51.8	46.6
Thin	27.8	24.0	20.0	50.0	57.3

Popular poultry pointers, R. R. Hannas (*New York: Macmillan Co., 1923, pp. [13]+207, pls. 31, figs. 12*).—Most of the chapters in this book have been previously published as separate papers. The general phases of poultry production, including choice of breed, planning the poultry plant, breeds, size of flock, feeding, marketing eggs, and raising of chicks are discussed in turn.

California poultry production, R. B. Easson (*San Francisco: Pacific Rural Press, 1923, pp. VII+9–175, pls. 11, figs. 2*).—The poultry practices which have proved most successful in California are described, with special reference to housing, breeding, feeding, and marketing. Separate chapters are also devoted to turkeys and ducks.

Feeding chickens in Canton, W. L. Funkhouser and L. Hoh (*Lingnaam Agr. Rev., 1 (1923), No. 2, pp. 1–6, pl. 1*).—A brief discussion of the feeds and methods employed in the fattening of poultry in Canton, China, is given.

DAIRY FARMING—DAIRYING.

Final report of the president, World's Dairy Congress Association, H. E. Van Norman (*[Washington, D. C.: Natl. Dairy Union, 1924], pp. 16*).—This includes the financial report and a brief history of the World's Dairy Congress, as well as other miscellaneous information.

Report of the proceedings of the National Milk Conference . . . 1922 (*London: Natl. Clean Milk Soc., Inc., [1923], pp. [4]+222*).—This consists of the proceedings of the National Milk Conference held in London from October 16 to 18, 1922, under the direction of the National Clean Milk Society. The following papers, with discussions of each, were presented: Dairy Breeds of Cattle in Relation to Quantity, Chemical Composition, and Cost of Production of Milk, by J. Mackintosh; The Effect of Feeding of Dairy Cattle in Relation to the Cost of Milk Production, by G. H. Garrad; Contagious Abortion, by S. Stockman; The Production of Clean Milk, by F. A. Lejeune; Bovine Tuberculosis in Relation to Man, by A. S. Griffith; The Tuberculin Tests, by S. R. Douglas; Variation in the Composition of Cows' Milk, by C. Crowther; The Handling and Distribution of Milk, by J. Robertson; On Pasteurization, etc., by G. Dreyer; Safeguarding Milk, by C. E. North; The Food Value of Milk and Its Care in the Home, by R. Hutchison; and The Campaign for the Production of Pure Milk, by A. D. Hall.

Dairy cattle, J. Mackintosh (*London: Ernest Benn, Ltd., 1923, pp. IV+77, fig. 1*).—This is a brief handbook on dairy cattle dealing with the feeding, management, and breeding of dairy cows, bulls, and young stock.

Studies on conformation in relation to milk producing capacity in cattle.—III, Conformation and milk yield in the light of the personal equation of the dairy cattle judge, J. W. Gowen (*Maine Sta. Bul. 314 (1923), pp. 69–96, fig. 1*).—This is the third paper (E. S. R., 45, p. 678) based on the relation between the milk yields of Register of Merit Jerseys and the scores given to each animal by 19 competent judges. The material is discussed mainly from the standpoint of the correlations between the milk yields and the total score and score of the various characters of the animals as a method of determining the emphasis placed on the different characters by the different judges in estimating milk-producing capacity.

The judges were classified as good, fair, and poor according to their success in selecting the higher producers by their scores. The good judges apparently found most to indicate milk yield in the total score, rear udder, wedge shape of body and deep large paunch, milk veins, large sized udder, neck, teats, general appearance, thighs, broad and level udder, and fore udder. Good judges were, however, able to judge well in most all characters, whereas poor judges were equally poor in judging all characters.

The study indicates that each judge has a different ability to estimate milk yield, but the average correlation coefficient between total score (the best indicator of production) and milk yield was 0.38, which is indeed low. It is thus suggested that where possible milk records should be kept as a basis for selecting dairy cattle.

Experimental feeding [of milch cows], G. B. Rothwell (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1922 pp. 7–14*).—Several feeding experiments with dairy cattle have been conducted by the Canadian Department of Agriculture.

Corn silage v. roots (mangels) for dairy cows.—In this experiment 7 Holstein and 4 French Canadian cows received average daily supplements to a ration of corn and hay during five 3-week periods as follows: (1) 40 lbs. of corn silage, (2) 23 lbs. of corn silage and 58 lbs. of roots, (3) 32 lbs. of corn silage, (4) 73 lbs. of roots, and (5) 33 lbs. of corn silage. Records of the production were taken only during the last week of each period, the average daily milk production for the respective periods calculated in that manner being 31.13, 31.90, 26.15, 25.21, and 21.45 lbs. On the corn silage and root ration there was produced 11.3 per cent more milk and 9.8 per cent more fat than on the silage ration. The cost per 100 lbs. of milk was also slightly greater. On the root ration there was produced 5.92 per cent more milk and 1.6 per cent more fat than on the straight silage ration, and the cost per 100 lbs. of milk was calculated as 16.3 per cent greater.

Corn silage v. peas, oats, and vetch silage.—This experiment was conducted similar to the one above. Corn silage was fed during the first and third periods and pea, oat, and vetch silage during the second. The average daily milk production of the 14 cows during the final week of the two corn silage periods was 33.03 and 27.15 lbs., and 29.68 lbs. during the period when pea, oat, and vetch silage was fed. The averages were slightly in favor of corn silage for milk production 1.4 per cent, but 4.8 per cent in favor of oat, pea, and vetch silage for fat production. Both fat and milk were, however, produced more economically with corn silage. The oat, pea, and vetch silage used in this experiment was not of the best quality.

In a repetition of this test with 19 cows, the average daily milk produced in the corn silage periods was 21.61 and 21.6 lbs. but only 20.77 in the pea, oat, and vetch silage periods. Both milk and fat were again produced much more economically with corn silage.

It is concluded that, though pea, oat, and vetch silage compares favorably with corn silage in its ability to produce milk, the high cost of production and the poor keeping qualities make it less economcal than corn silage.

Corn silage v. sunflower silage.—Two experiements in which corn silage was compared with sunflower silage were carried on similar to the above. Seventeen cows were used in the first and 12 in the second experiment. Corn silage was fed in the first and third and sunflower silage in the second feeding periods. The milk production was 1.25 per cent in the first experiment and 5 per cent in the second greater with corn silage, while the fat production was 0.9 and 3.8 per cent greater. The milk and fat were produced more economically with the sunflower silage, however. The lack of palatability and the geater tendency of sunflower silage to freeze because of the higher water content are pointed out.

Feed the cow for milk, H. S. Willard (*Wyo. Farm Bul., 12 (1923), No. 1, pp. 24, figs. 16*).—A popular presentation of the principles of feeding dairy cattle.

Rearing calves and heifers, H. A. Hopper (*N. Y. Agr. Col. (Cornell) Ext. Bul. 73 (1923), pp. 20, figs. 5*).—A popular presentation of the principles to be observed in raising dairy heifers.

Sunflowers versus corn for growing heifers, C. F. Bailey (*Canada Expt. Farms, Fredericton (N. B.) Sta. Rpt. Supt. 1922, pp. 9, 10*).—In a 28-day experiment sunflower and corn silages were compared for growing heifers when fed with a daily ration of 6 lbs. of hay and 4 lbs. of grain. Seven heifers in each lot consumed 980 lbs. of either silage. The average daily gains made were 1.8 lbs. on corn silage and 2.1 lbs. on sunflower silage.

The heifers were then continued for 8 days more on this ration, with the addition of pasture in the last 3 days. During the 8 days the steers on corn silage lost an average of 28.57 lbs. and those on sunflower silage 39.28 lbs. It is concluded that the larger gains made by the sunflower group during the regular test were due to the larger amounts of feed in the intestine, which was lost during the 3 days on pasture.

[Cost of raising dairy heifers], W. W. Baird (*Canada Expt. Farms, Nappan (N. S.) Farm, Rpt. Supt. 1922, p. 13*).—In raising 9 dairy heifers to one year of age, it was found to require an average of 1,089 lbs. of whole milk, 2,527 lbs. of skim milk, 712 lbs. of grain, 600 lbs. of roots, 1,196 lbs. of hay, and 482 lbs. of green feed, costing an estimated total of $46.45. To raise 11 heifers from one to two years of age there was required an average of 948 lbs. of grain, 2,411 lbs. of roots and silage, 2,409 lbs. of hay, 240 lbs. of skim milk, and 132.5 days of pasture, at a total cost of $39.94.

The fat content of water buffalo milk on partial milking, and of the milk from each quarter, C. O. Levine and K. F. Koo (*Lingnaam Agr. Rev., 1 (1923), No. 2, pp. 15–21*).—Determinations of the fat content of the fore milk and strippings from each quarter of the udder of four buffalo cows with and without previously massaging the udder at Canton Christian College indicated that in the unmassaged udder there were greater differences, though not as great as had been reported for European cows.

The authors conclude that these results point toward the rising of the cream in the milk cistern.

Standard methods of milk analysis, bacteriological and chemical (*New York: Amer. Pub. Health Assoc., 1923, 4. ed., pp. [6]+40, figs. 3*).—Descriptions are given of the methods for making bacteriological and chemical analyses in milk as adopted by the American Public Health Association and the Association of Official Agricultural Chemists at their annual meetings in 1922.

Testing milk and cream, W. P. Hays (*Missouri Sta. Circ. 119 (1924), pp. 11, figs. 16*).—General directions for testing milk and cream by the Babcock test are given.

Factors influencing fat tests of milk, G. C. White and W. D. Burrington (*Conn. Agr. Col. Ext. Bul. 74 (1924), pp. 11, figs. 3*).—Variations in the fat test of milk are discussed from the viewpoint of breed, individuality of the cow, season of the year, stage of lactation, feed, etc.

Use of Endo's medium in locating milk contamination, L. A. Brown and E. J. Gott (*Amer. Food Jour., 18 (1923), No. 6, pp. 295, 296*).—This is a report of several years' successful use of Endo's medium for the detection of *Bacillus coli* contamination of milk at the Kentucky Experiment Station.

On the casein splitting ability of Lactobacillus casei and Streptococcus lactis [trans. title], A. I. Virtanen (*Soc. Sci. Fennica, Comm. Phys. Math., 1 (1923), No. 41, pp. 13*).—In this investigation 30 strains of ε-type and 10 of α-type of *L. casei* and 12 strains of *S. lactis*, isolated mostly from Emmenthaler cheese, were studied as to their ability to produce volatile acids in skim milk at 18 to 21°, 37, and 42° C. In studying the action of each strain on casein, 500 cc. of sterile skim milk containing 30 gm. of calcium carbonate was inoculated with 1 cc. of a 24-hour old vigorous culture, and the samples incubated at 18 to 21° and at 37° for two months. The *L. casei* cultures at 37° had fermented all the sugar, but large amounts remained in the cultures held at room temperature. There was always some sugar left in the *S. lactis* cultures. Determinations of the soluble nitrogen, amino nitrogen, and ammonia nitrogen are reported in tabular form for a number of the different strains at the different temperatures.

L. casei ε had practically no action on the casein, and *L. casei* α had only a very little action at the lower temperature, but at 37° both types markedly increased the percentage of soluble and amino nitrogen, with some increases in ammonia nitrogen. The strains of *S. lactis* varied in the extent of their activity, but in all cases it was greater at room temperature. Holding the materials at 42° for 20 hours, followed by two months' incubation at room temperature, resulted in the formation of considerably greater amounts of the three forms of nitrogen than at room temperature throughout. The *S. lactis* strains were also slightly more active under this treatment.

Further tests showed that the action of a mixed culture of *L casei* ε and *S. lactis* was greater when incubated for a short period at 42°, followed by a longer period at room temperature, than the action of either culture alone. In studying the duration of the activity of two types of Lactobacillus, it was found that the ε-type was dead within 30 days after inoculation, whereas the α-type was still living at 90 days. It is thus concluded that in Emmenthaler cheese production, the ε-type acts quickly and dies, but is followed by the action of the α-type. There is also a symbiotic relation between *S. lactis* and the action of the two types of *L. casei*.

The effect of formaldehyde upon the vitamin content of milk, A. M. Bleile and R. J. Seymour (*Science, 58 (1923), No. 1512, pp. 518–520, fig. 1*).—In two tests carried on in March and November, 1922, at Ohio State University, baby chicks were fed a ration of corn meal cakes, rice flour cakes, and unleavened white flour cakes, with access to grit, shell, and charcoal. The drink given the two other groups receiving the same ration consisted of raw milk in one lot and raw milk treated with one part of formaldehyde to 20,000 parts of milk in the other lot.

The chicks receiving no milk showed the lack of vitamins early. Those receiving milk grew well for a time, but slight symptoms of vitamin deficiency developed first in the raw-milk group and very shortly after in the group receiving milk treated with formaldehyde, indicating that winter milk is not a sufficient source of vitamin C. The results, however, further indicated that the vitamin C present was not injured by the formaldehyde.

A milk survey of several North Dakota cities, M. Jongeward and C. H. Mergens (*N. Dak. State Food Commr. and Chem. Bul. 6 (1924), pp. 30*).—A brief report of the results of a survey of the condition of the milk supplies of 12 North Dakota cities is given, with suggestions as to milk ordinances and methods of cleaning bottles and utensils.

The value of different types of covered pails in the production of clean milk, P. M. Hickson (*Milk Indus., 4 (1924), No. 7, pp. 49–51, figs. 3*).—In tests at the National Institute for Research in Dairying, milking into small-top pails was found to reduce the bacterial content of the milk from 68 to 64 per cent as compared with open-top pails. The amount of dirt recovered on a cotton wool disk filter was also greater from the open pail. These results were obtained with cows having clipped udders which had been washed and wiped prior to milking.

How to produce good cream, C. A. Hutton (*Tenn. Agr. Col. Ext. Pub. 121 (1924), pp. 16, figs. 13*).—A popular discussion of the recommended methods for cleaning dairy utensils and the cooling of cream.

The effect of milk plant operations on the amount of cream rising on milk, W. H. Martin and W. B. Combs (*Jour. Dairy Sci., 7 (1924), No. 2, pp. 197–204, fig. 1*).—A study of the effect of different operations in the milk plant on the cream layer is reported from the Pennsylvania Experiment Station. The milk was processed in each case, after which samples were placed in cylinders graduated to read the percentage of cream showing and held for 24 hours at 35° F., during which time hourly readings were made. The results showed a slight increase in the cream rising on clarified milk, but when the milk was heated to 90° before or after clarification practically no reduction occurred. Pumping hot milk also caused a slight reduction in the cream layer, but pumping had no effect on cold milk.

The effects of pasteurization seemed to be largely dependent on the length of the holding process, the agitation of the milk, and the method of cooling. Pasteurization had little effect up to two hours, but after that the reduction amounted to from 20 to 65 per cent. Slow cooling and agitation also reduced the cream layer. The authors conclude that " the fundamental cause of variation in creaming ability of milk will possibly be found in the milk serum, and not the butterfat, as has long been the opinion."

Lactic fermentation, its utilization in the manufacture of butter [trans. title], S. S. Soriano (*Rev. Facult. Agron. y Vet. Buenos Aires, 4 (1923), No. 2, pp. 197–272, figs. 10*).—The first part of this article deals with the cultural and morphological characteristics of the more common organisms found in starters with relation to the chemical changes which each produces. The second part deals with the effect of various methods of ripening and pasteurization of cream and the storage of butter on its flavor and other qualities. This work was reported from the University of Buenos Aires.

Collection of legislative prescriptions concerning cheese, A. J. Swaving (*The Hague: Natl. Com. Internatl. Zuivelbond, 1923, pp. 104, figs. 11*).—The legal requirements governing the manufacture of cheese are summarized for 33 countries of the world.

Studies of fat globules and air cells in ice cream which show how manufacturing processes affect these important accessories to quality, M. Mortensen (*Ice Cream Trade Jour., 20 (1924), No. 4, pp. 74–76, figs. 7*).—The conclusions derived from studies of the factors influencing the texture of ice cream at the Iowa Experiment Station are briefly summarized. Homogenization tends to reduce the size of the fat globules, but they form in clusters which are broken up by agitation during freezing, the viscosity of the mix is increased, and the size of the air particles incorporated are small.

VETERINARY MEDICINE.

Report of the New York State Veterinary College at Cornell University for the year 1922–23 (*N. Y. State Vet. Col. Rpt., 1922–23, pp. 234, pls. 2, fig. 1*).—Included in this report are the following papers: Intestinal Parasites of Dogs, by J. H. Milks (pp. 49–57); Report of Poultry Disease Investigation, by J. W. Fuller (pp. 58–61); A Study of Bang Abortion Disease in Cattle, by R. R. Birch and H. L. Gilman (pp. 62–155); A Test for Peristaltic Activity (pp. 156–159) and The Rate of Passage of Material Through the Digestive

Tract (pp. 160–166), both by P. A. Fish; The Blood, Urine, and Tissue Juices in Azoturia, by C. E. Hayden (pp. 167–174); The Thermal Death Points of Tubercle Bacilli and Their Bearing on Pasteurization of Milk, by J. Traum (pp. 174–203); Immunizing Young Pigs Against Hog Cholera, by J. W. Benner (pp. 204–213); and The Pathology of "Posterior Paralysis," by S. A. Goldberg et al. (pp. 214–232).

The preparation of bacterial antigens, C. O. Melick (*Diss., Univ. Chicago, 1922, pp. 15, figs. 4*).—In this dissertation, the author discusses briefly the complications in the present methods of preparing bacterial antigens and outlines methods which he has found satisfactory for overcoming these difficulties. The general principles involved are three in number, (1) the elimination of admixed culture medium protein, (2) the disintegration of bacterial cells with the least amount of chemical modification, and (3) the preservation of the antigen without the addition of chemical preservatives.

The first is accomplished by the use of a protein-free medium consisting of redistilled water 1,000, sodium chlorid 5, asparagin 3.4, disodium hydrogen phosphate 2, magnesium sulphate 0.5, and ammonium lactate 6.3 parts. After dissolving, the medium is adjusted to +0.2 acid by the addition of sodium carbonate, autoclaved for 10 minutes at 10 lbs. pressure, tubed, and autoclaved again as before. This medium has been found suitable for the growth and transfer of the organisms used without loss of antigenic properties.

The disintegration of the bacterial cells is accomplished by rapid freezing and thawing of the culture in special silver-plated metal tubes, the process being repeated in rapid succession from 20 to 25 times. The solution obtained after centrifuging is said to possess a much higher antigen content than the total suspension and to be completely lacking in anticomplementary action.

The preservation of the antigens without the use of chemical preservatives is accomplished by keeping them in a frozen state in small glass tubes in a refrigerating chamber at −18° C. Antigens thus preserved are said to be serviceable for at least three years.

The duration of immunity following immunization against erysipelas, L. Hoffmann (*Ueber die Dauer der Immunität nach der Rotlaufschutzimpfung. Inaug. Diss., Hessische Landes-Univ., Giessen, 1922, pp. 7*).—As a result of immunization experiments conducted on mice and of the author's experience in the immunization of swine against erysipelas, the conclusion is drawn that the simultaneous immunization against erysipelas is of the nature of an active immunization. Passive immunization is of very short duration.

In practice the author recommends immunization with serum alone only in the case of infected herds. In the simultaneous immunization minimal doses of serum and maximal of the culture should be used. It is considered safest to follow the simultaneous immunization with an increased dose of the culture from 10 to 14 days later, but in practice this adds considerably to the cost.

The foot-and-mouth disease, E. T. Meredith (*Dairy Farmer* [*Des Moines*], *22* (*1924*), *No. 11, pp. 10, 18, 19, fig. 1*).—This account of the occurrence of foot-and-mouth disease in California and means for its control includes a map showing the infected areas.

Hemorrhagic septicemia studies.—The development of a potent immunizing agent (natural aggressin) by the use of highly virulent strains of hemorrhagic septicemia organisms, W. S. Gochenour (*Vet. Med., 19* (*1924*), *No. 6, pp. 351–355; also in Jour. Amer. Vet. Med. Assoc., 65* (*1924*), *No. 4, pp. 438–441*).—A brief report is given of hemorrhagic septicemia studies conducted with a virulent culture obtained from the heart blood of several buffaloes which died of acute disease in the Yellowstone National Park in March, 1922.

The organism is said to exhibit all the characteristics of the Pasteurella group and to be distinguished by its very high virulence for all species of domestic animals, whatever their age or condition. Its relationship with bovine strains is shown by tabulated cultural characteristics of this strain and three bovine strains and by similarity in complement fixation tests and in animal protection tests. During a period of over two years no appreciable diminution in the virulence of the organism could be detected. The symptoms following injection and the autopsy findings were quite uniform. The large amount of exudate produced was found to have the properties of an aggressin and to be suitable for use as an immunizing agent against hemorrhagic septicemia. Immunity experiments conducted on a limited scale with yearling cattle showed a much greater degree of protection against severe exposure to the hemorrhagic septicemia organism in the aggressin-treated animals than in the yearlings treated with vaccine and bacterin. Since relatively large quantities of exudate can be obtained from animals infected with this organism, a potent immunizing agent in the form of the natural aggressin is available.

Observations and autopsy of some goats which were natural carriers of Micrococcus melitensis.—Importance of the mammary gland [trans. title], E. BURNET and C. ANDERSON (*Arch. Inst. Pasteur Tunis, 13* (*1924*), *No. 1, pp. 7–18*).—Detailed reports are given of the examination, with reference to *M. melitensis*, of 5 goats suspected, through agglutination tests or other observations, to be carriers of *M. melitensis*, and of 1 goat which had been under observation through a period of 9 months and had been inoculated several times with *M. melitensis*. The general conclusions drawn from the investigation are as follows:

There is no relationship between the state of general health of a goat and melitensis infection. The temperature of infected goats is almost always normal and gives no index of infection. Neither the presence of agglutinating bodies in the serum nor of the organism in the circulating blood or milk is a regular and constant fact in infected goats. The serum of heavily infected goats does not always have agglutinating properties and is sometimes sterile even after the experimental inoculation of large doses of virus.

In infected goats reactions to intracutaneous and subcutaneous inoculation of melitin and thermal reactions are often positive, but these reactions are not regular and do not furnish a safe method of diagnosis. There is no constant relation between the state of infection and the presence of leucocytes in the milk.

These observations and the fact that in the goat inoculated and reinoculated with heavy doses of the organism the virus was recovered only in the lymphatic glands have led to the conclusion that the seat of infection of *M. melitensis* in the goat is the mammary gland.

Studies on intradermal tuberculin, W. A. HAGAN and J. TRAUM (*Cornell Vet., 14* (*1924*), *No. 2, pp. 182–217*).—The investigation reported was undertaken largely as the result of the disturbing factor of "no lesion" tests sometimes occurring in the official intradermal tuberculin test for cattle.

Tuberculins prepared in the laboratory of the New York State Veterinary College where the investigation was conducted and obtained from other reliable sources were tested for toxicity for white mice and for specific and nonspecific reactions with guinea pigs and cattle. The types of tuberculin used, the preparation of which is described in the introductory section, included fluid intradermal tuberculin, the same detoxified by fractional precipitation, single alcohol precipitated tuberculin, double alcohol precipitated tuberculin, detoxified double alcohol precipitated tuberculin, alcohol fractional precipitate, and acetone tuberculin as prepared in the laboratories of the Bureau of Animal Industry, U. S. D. A., for ophthalmic discs.

The intradermal injection into white mice of concentrated solutions of tuberculin produced acute reactions of two types, followed by death in a few minutes. In the first type the most marked symptom was violent interference with respiration, resulting in convulsive struggles, and in the second a semicomatose condition following hurried respiration at first. No marked difference in toxicity was apparent in the preparations tested, all of them causing death in a few minutes with a dosage of 0.5 cc. The detoxified preparation was slightly less toxic than the original fluid tuberculin, and the acetone tuberculin had the least and the alcohol double precipitated tuberculin the greatest toxicity of the various precipitated tuberculins.

The uninoculated tuberculin medium proved toxic for mice, and tests of the various ingredients separately showed glycerin to be the principal factor in causing toxicity.

Guinea pigs presenting almost all forms of artificially induced tuberculosis, together with normal guinea pigs, were tested intradermally, each with two types of tuberculin, and observed for specific and nonspecific reactions. In practically every group of the nontuberculous animals tested some showed skin sensitiveness, manifesting itself in swelling or necrosis, and others did not. In the infected guinea pigs skin sensitiveness was manifest in most cases from 15 to 30 days, depending upon the virulence of the organism and the size of the infecting dose. On retesting at weekly intervals, most of the animals reacted well to all tests, although in a few cases one or more positive tests were followed by negative and in others no reaction was evident. Some reacted to one tuberculin and not to another. As a result of observations on guinea pigs a theory of the mechanism of intradermal tuberculin reaction has been developed as follows:

"In the course of the disease a 'reacting substance' is produced which renders the skin sensitive to tuberculin. The amount of this 'reacting substance' and consequently the degree of sensitiveness of the skin varies greatly in different animals. In some it is so slight that an intradermal reaction may not be obtained at any stage of the disease. In others the amount of 'reacting substance' may be great enough to give a typical reaction to one tuberculin, but not to two or more applied simultaneously. In still others the 'substance' may be sufficiently abundant to give as many as four simultaneous reactions. After the 'reacting substance' has been used up in the course of an intradermal reaction, some time is required for the production of a new supply. Since the progress of the disease is quite rapid in guinea pigs, this interval is usually short."

In general, the results obtained with cattle paralleled those with guinea pigs. When the retest was carried out soon after the first test a considerable number of animals failed to react with any tuberculin, while some reacted to one and not to another. The tuberculins showed somewhat less difference in nonspecific effects than when tested on guinea pigs. The resemblances, however, between the guinea pigs and cattle in nonspecific and specific reactions were such as to lead to the conclusion that there is a definite relation between the nonspecific effects of the tuberculins on the two species of animals used, and that there is also a correlation between these results and the degree of toxicity for white mice.

In the selection of tuberculins for intradermal use, the method is stated as follows: "Our tentative procedure at the present time is to test a portion of each lot of tuberculin on the skin of normal guinea pigs, using a 25 per cent solution of the O. T. [old tuberculin]. If the average nonspecific induration at 48 hours on 10 or more animals does not exceed a diameter of 3 to 4 mm., and if there is an absence of necrosis in the majority of the animals, the lot is regarded as satisfactory for intradermal use. If the nonspecific effect is higher than this the lot is reserved for use in the subcutaneous test."

No-lesion tuberculin-reacting cattle, E. C. SCHROEDER (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 5, pp. 544–552*).—In this general discussion, one of the possible causes suggested in explanation of positive tuberculin reactions in a certain number of nontuberculous cattle is the sensitization of the cattle in question through the ingestion of tubercle bacilli of the human type.

Some observations relative to bovine infectious abortion, J. M. BUCK (*North Amer. Vet., 5 (1924), No. 6, pp. 237–241*).—This is a general discussion of the mode of transmission of bovine infectious abortion, the location of the causative organism in the animal body, and the symptoms, prevention, and control of the disease.

Experiments on the immunity conferred on calves by inoculation against cattle plague, D. S. RABAGLIATI (*Jour. Compar. Path. and Ther., 37 (1924), No. 1, pp. 1–18, figs. 3*).—The investigation which is reported in this paper was undertaken with a view of testing the theory advanced by Croveri (E. S. R., 42, p. 568) that calves born of cows which are actively immune to rinderpest are passively immune through being born with a large store of antibodies and increasing this store by drinking their mothers' milk.

The first series of experiments was arranged to test the immunity of calves born of cows immunized by double inoculation during pregnancy and reacting to the inoculation. Of 7 calves tested with 2 cc. of virus at one month (while still suckling) and again at five months, or one month after weaning, none reacted to both tests, 1 to the first but not to the second, 2 to the second and not to the first, and 4 negatively to both tests. Of 5 tested one month after weaning, only 1 gave a positive and 4 negative reactions. All of these proved immune at periods varying from 1 year 6 months to 1 year 10 months of age.

The conclusion drawn from this part of the investigation is that calves born of cows which have reacted to the double inoculation during pregnancy may react to the inoculation of virus while still suckling, but more frequently do not react to such an inoculation and in this case may react to a further injection of virulent blood after weaning. Some appear to have a certain resistance to rinderpest, at least for several months. The experiment is also thought to prove that it is safe to inoculate pregnant cows by the simultaneous method since there were no abortions, although in many cases pregnancy was far advanced.

In the next series a similar study was made of the susceptibility of calves born of cows immunized by the simultaneous method before pregnancy. Of 8 calves inoculated subcutaneously with 2 cc. of virulent blood while still suckling, only 1 gave a reaction and this was followed by recovery. When retested at from 7.5 to 12 months of age, the 7 which did not react to the previous test gave a strong reaction, while the 1 that reacted to the first test did not react.

Eight calves of cows similarly immunized before conception were given a double inoculation at ages of from 6 to 9 months. Only 5 of these reacted, and all recovered.

These results are thought to indicate that the calves of cows doubly inoculated before conception may react to inoculation of virulent rinderpest blood while still suckling, but more frequently do not react to such an injection. Calves thus inoculated appear to have a certain resistance to rinderpest, but the resistance is less than that of calves born of cows reacting to the double inoculation during pregnancy.

The final experiment, which was carried out by H. Cooper, was arranged to test the immunity conferred by double inoculation of calves less than 18 months of age at the time of inoculation, the tests being made at periods varying from 3.5 to 23.5 months after the inoculation. Of the 98 calves comprising the entire group, only 4 developed rinderpest on the retest, and only 1 of these died. This is thought to indicate that the double inoculation of calves between 12 and 18 months of age confers a satisfactory immunity.

In discussing these results with reference to the work of Croveri, it is concluded that the double inoculation of suckling calves can not be relied on, but should be repeated a few months after weaning even when the first inoculation is apparently successful. During an outbreak of rinderpest it is considered advisable to include the suckling calves in the general vaccination, even though the vaccination should be repeated later. The double inoculation of calves soon after weaning is considered to give good results, but the duration of the immunity thus conferred has not been determined. The double inoculation of young stock from a year old upwards can be relied on as in the case of adult cattle.

Horse-sickness in 1923, P. J. du Toit (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 4, pp. 370–382, figs. 2*).—Reporting upon the occurrence of this disease, the author states that the summer of 1922–23 was one of the severest horse-sickness seasons yet recorded.

Equine piroplasmosis, nuttalliosis, or biliary fever, as it occurs in India, G. F. Steevenson (*Vet. Rec., 4 (1924), No. 15, pp. 315–322, figs. 2*).—This is an extended report of studies by the author, an officer of the Royal Army Veterinary Corps.

The employment of Bayer 205 for the treatment of surra in horses in the Dutch East Indies [trans. title], E. Rodenwaldt and J. B. Douwes (*Nederland. Indische Bl. Diergeneesk. en Dierent., 33 (1922), No. 5–6, pp. 1–79, pls. 2; abs. in Trop. Vet. Bul. 11 (1923), No. 2, pp. 45–50*).—In reviewing the results of their work the authors conclude that a horse may be cured of surra by a single large dose of Bayer 205, about 5 gm. per 200 kg. of body weight, or by a series of smaller doses, consisting of 0.5 gm, per 150 or 200 kg. given every other day until a total of 10 gm. or, if possible, 15 gm., has been administered.

A description of the method for collecting blood samples from breeding stock to be tested for "carriers" of bacillary white diarrhea, F. R. Beaudette (*New Jersey Stas., Hints to Poultrymen, 12 (1924), No. 9, pp. 4*).—A brief descriptive account.

RURAL ENGINEERING.

Surface water supply of Ohio River basin, 1919 and 1920 (*U. S. Geol. Survey, Water-Supply Paper 503 (1924), pp. VI+257, pls. 2*).—This report, prepared in cooperation with the States of Pennsylvania, West Virginia, Kentucky, Illinois, and Tennessee, presents the results of measurements of flow made on streams in the Ohio River basin during the years ended September 30, 1919 and 1920.

Notes on strength of timbers with list of transverse tests on specimens in the technological museum, M. B. Welch (*[N. S. Wales] Technol. Mus. Bul. 6 (1923), pp. 12*).—Data on strength tests of several different Australian timbers are presented and discussed. These included tensile, compression, and shearing tests, and data were obtained on moduli of rupture and of elasticity.

What makes good concrete? H. H. MUSSELMAN (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 168, 169*).—Data are briefly presented indicating that the strength and general utility of concrete depend upon the wetness of the mix, the proportions, grading of material, and method of curing.

Impervious concrete, H. C. BADDER (*London: Educational Pub. Co., Ltd., 1923, pp. XX+204, figs. 29*).—This book contains information on the selection of aggregates, mixing and depositing of concrete, finishing of exposed surfaces, and the completion of day work joints and expansion and contraction joints in order to secure impervious concrete. Chapters are included which discuss aggregates, sand, proportioning, water, relative consistency, water-cement strength, and inundation sand methods; Portland cement, white Portland cement, alumina cements, electric, cement fondu, etc., and oxychlorid cement; mixing concrete, machinery and plant for mixing concrete, concrete factors, concrete forms, tools in finishing concrete, spouting concrete, and concrete repairs; impervious concrete, impervious joints in concrete, and concrete for chemical work; portable concrete construction units, precast concrete, precast work in France, vibration for precast concrete, coloring cements, and painting concrete; concrete finishing, jointing pipes, cement mortar, and hard, dustless concrete; concrete roads, Bates experimental road, and test concrete road, California. Specifications for concrete, directory of testing engineers, a glossary of concrete terms, and tables applicable for concrete work are included.

Protection of concrete against alkali, E. C. E. LORD (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 3, pp. 23–25*).—The progress results of two series of tests of water-gas and coal tars and paraffin treatments of concrete as protection against solutions of alkali are briefly reported. The specimens employed in the first experiments consisted chiefly of sections of well-seasoned 6-in. concrete draintile containing very little coarse aggregate and ordinary tension and compression strength specimens made of 1 part cement and 3 parts sand.

The tile sections were immersed in thin liquid water-gas tar at room temperature until all air had been expelled, when they were removed and allowed to drain and dry in air, or they were heated in the air bath at 110° C. for 4 hours. It was found that the maximum amount of tar absorbed was from 7 to 8 per cent after draining for 24 hours and about 4.5 per cent when dried in the air bath.

The test specimens were exposed to a solution containing 1.5 per cent of sodium sulphate and 1.5 per cent of magnesium sulphate. The results indicated from sevenfold to ninefold protection in the case of thoroughly impregnated material, and about fourfold protection when insufficient tar was absorbed or where the fixation of the tar residuum was incomplete before exposure to the alkali solutions. Tension and compression tests showed that, while the untreated samples failed completely after 6 months in a 3 per cent alkali solution, the treated specimens gave higher values for tension and about the same for compression as those stored in tap water for the same length of time. Treated samples stored in 10 per cent alkali solution showed a loss in tension of about 50 lbs. as compared with the untreated samples after 6 months in tap water, but were 224 lbs. stronger than untreated samples stored in 10 per cent alkali solution for the same length of time. These results are taken to indicate that water-gas tar, if thoroughly incorporated in concrete, offers an effective protection against the action of saline solutions for a considerable period at least.

A continuation of these experiments on a somewhat larger scale with coal-gas tar and paraffin in addition to water-gas tar showed that samples of concrete receiving 10 coats of water-gas tar and 1 coat of coal-gas tar indicated a minimum loss in lime and increase in weight.

Samples from all batches receiving 4 coats of the paraffin solution after saturation indicated about the same resistance to alkali attack as the tar-treated samples, whereas samples immersed for 24 hours in the paraffin bath but receiving no surface application of paraffin suffered an appreciable loss in lime after 8 months' exposure to the action of the alkali solution.

Wear of concrete pavements tested, F. H. JACKSON and J. T. PAULS (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 3, pp. 1–19, figs. 15*).—Data from accelerated wear tests of 62 concrete test sections, each 4 ft. wide by about 10 ft. long and constructed in the form of a circle approximately 625 ft. in circumference, are reported. These sections were subjected to approximately 300,000 passages of a solid rubber-tired truck wheel, loaded to 3,000 lbs. and traveling around the circle over the same path at a speed of 22 miles per hour. On the basis that about 10 per cent of the total traffic passes over a 6-in. width at the point of greatest concentration it was estimated that the experimental sections were subjected to a traffic equivalent to about 1,500,000 2-ton trucks operating at a speed of 22 miles per hour. In addition, the test sections were subjected to about 50,000 passages of a rubber-tired wheel loaded with the same weight and equipped with nonskid chains and the same number of passages of a plain rubber-tired wheel. The primary object of the test was to determine what relations exist between the surface behavior of concrete roads under traffic and the various laboratory tests for quality of the aggregates.

The results showed that the rate of wear of stone concrete is in general not affected by the coarse aggregate, provided the coarse aggregate is equal or superior to the mortar matrix in resistance to wear. Excessive wear resulted from the use of very soft stone as aggregate, even though used in conjunction with a mortar of satisfactory quality. The results are taken to indicate that stone with a percentage of wear greater than 7 should not be used in concrete road construction. Gravel concrete was, in general, as satisfactory from the standpoint of wear as stone concrete. Gravels consisting essentially of siliceous materials were superior as regards both the amount and uniformity of wear to those containing a preponderance of calcareous fragments. Small amounts of shale occurring in the coarse aggregate caused both excessive and uneven wear.

It was found that the modified abrasion test for gravel in its present form is not an indication of the wear-resisting properties of coarse aggregates. It is suggested that if the severe impact action of the steel balls were decreased much more indicative results would be secured.

Th results further indicated that blast furnace slags should prove satisfactory for use in concrete pavements provided the proportion of light porous slag is so controlled that the weight per cubic foot will be at least 70 lbs. The presence of large amounts of light porous fragments in blast furnace slag was found to cause excessive year. Somewhat better results were secured by the use of the smaller sizes of slag. Slag or stone screenings were in general unsatisfactory as substitutes for natural sand as fine aggregates in concrete road construction. Copper and lead smelter slags were found to be satisfactory aggregates from the standpoint of wear.

Coarse sands, other things being equal, showed greater resistance to wear than fine sands. The so-called tensile-strength-ratio test was no indication of the wear-resisting properties of concrete made with these sands, and the Talbot-Jones wear test was not in general an indication of the wear which takes place under traffic. It also was found that neither the crushing nor the transverse strength of concrete is a measure of its wear-resisting properties.

The addition of hydrated lime did not affect the wear-resisting properties of concrete. Increasing the cement content beyond a cement-sand ratio of 1:2 did not materially affect the resistance to wear of the concrete. Leaner mixes showed marked increase in wear. It is concluded that either an excessively dry or an excessively wet mix will show less resistance to wear than concrete of medium consistency.

White joint filler for concrete roads, L. G. CARMICK (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 3, pp. 21, 22, figs. 4*).—The results of a two years' trial of a light colored material developed by the Bureau of Public Roads for use as a filler for joints and cracks in concrete roads are briefly presented, indicating that the material has qualities which make it decidedly valuable for the purpose. The material is an intimate mixture of crude unvulcanized rubber with rosin in the proportion of 1 part of rubber to about 10 of rosin, to which mixture is added a considerable quantity of a neutral white pigment, preferably barytes or titanox.

Public Roads [May, 1924] (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 3, pp. 28, figs. 21*).—This number of this periodical contains the status of Federal aid as of April 30, 1924, and the following articles:

Wear of Concrete Pavements Tested, by F. H. Jackson and J. T. Pauls (see p. 588); Road Bond Issues in Relation to Total Debt, by H. R. Trumbower; White Joint Filler for Concrete Roads, by L. G. Carmick (see above); Protection of Concrete Against Alkali, by E. C. E. Lord (see p. 587); Effect of Alkali on Strength of Mortar, by C. E. Proudley; and Road Material Tests and Inspection News.

An investigation of the maximum temperatures and pressures attainable in the combustion of gaseous and liquid fuels, G. A. GOODENOUGH and G. T. FELBECK (*Ill. Univ., Engin. Expt. Sta. Bul. 139 (1924), pp. 158, figs. 27*).—A brief résumé of the important laws of gas mixtures is followed by an outline of the general theory of chemical equilibrium and the derivation of equilibrium equations for various reactions, with particular reference to combustion. The energy equation is developed, and the method of solving the system of equations for the maximum temperature is shown. Comparisons and applications of the theory are included.

An electrical method for the reduction of draught in ploughing, E. M. CROWTHER and W. B. HAINES (*Jour. Agr. Sci. [England], 14 (1924), No. 2, pp. 221–231, figs. 6*).—Studies conducted at the Rothamsted Experimental Station are reported, the purpose of which was to develop a simple electrical method for the reduction of the friction between plow moldboards and the soil. The method developed depends upon the phenomenon of electroendosmose which is exhibited by moist soil. By virtue of the negative charge of the soil colloids, water will move through moist soil toward the negative electrode under the action of an electric current. It was found that if a current was passed through the soil having the moldboard of a plow as the negative electrode, the film of water formed at the soil-metal surface acted as a lubricant and reduced the plowing draft.

Striking reductions in friction were obtained in laboratory experiments with a metallic slider moving over moist soil. Field tests demonstrated that the draft of a plow could be reduced by applying a current between the colter and the moldboard. The magnitude of the reduction obtained with this arrangement was too small to have an immediate practical value, but the method is considered to have possibilities.

The construction of a muck roller, P. M. HARMER (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 170–174, figs. 3*).—Drawings and a bill of material and general information on the construction of a muck roller are presented. It is stated that the use of a heavy roller has proved to be beneficial to many crops on muck land.

Principles of dairy-barn ventilation, M. A. R. Kelley (*U. S. Dept. Agr., Farmers' Bul. 1393 (1924), pp. II+22, figs. 13*).—The general principles underlying the ventilation of barns are explained, and systems in common use are discussed.

It is stated that a good dairy barn ventilation system, if properly installed and operated, will supply without draft the abundance of fresh air necessary to the health and comfort of cows, will make possible control of barn temperature, will preserve the building and feed stuffs from mold and rot due to excessive moisture and make spontaneous combustion less likely, and will provide a measure of disease prevention and control.

It is stated further that a dairy cow breathes approximately 116 cu. ft. of air per hour. While the percentage of carbon dioxid in the barn air is usually the test of the degree of ventilation, it is pointed out that it is not a poison but that its injurious influence is one of the displacement of the required fresh air.

Remodeling an old farm house, H. J. Gallagher (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 174–176, figs. 2*).—Information and drawings on the remodeling of an old farmhouse are presented.

Imhoff tanks—reasons for differences in behavior, H. P. Eddy (*Amer. Soc. Civ. Engin. Proc., 50 (1924), No. 5, [pt. 3], pp. 616–645, figs. 3*).—Studies are reported to ascertain the reasons for the differences in operating results obtained from Imhoff tanks in order that the requirements for satisfactory results may be better understood.

The results showed that the mineral and heavy, relatively stable, organic matter of combined sewage may tend to prevent the formation of excessive scum and foam, and that coarse and uncomminuted solids are probably important factors in the excessive formation of scum. It was found that where the water supply is hard the insoluble soaps formed constitute a substantial increment in the suspended solids of the sewage and may favor the formation of foam and scum. The variation in the quantity of suspended solids to be removed from different sewages was found to be so great that the design of the digestion compartment should be based on the quantity of solids to be deposited in it, rather than on a general assumption of a definite number of cubic feet per capita.

Temperature is a factor of fundamental importance in the digestion process. The required capacity of the digestion compartment is governed largely by the available temperature and by the duration of the period of low temperature. It is concluded that difficulties will be minimized by drawing sludge as early in the spring as inoffensive material can be obtained, by continuing the drawing at a rate sufficient to provide as small an accumulation in the sludge compartment as practicable during hot weather, and by removing all sludge except that required for seeding before cold weather.

Fine screening was found to reduce the load on the digestion compartment and to reduce scum formation. It appeared important to distribute the deposited solids as uniformly as possible throughout the digestion compartment, indicating the advantage of a relatively short tank.

Digestion compartments should be subdivided as little as practicable, and liberal opportunity should be afforded the sludge to spread uniformly from one end of the tank to the other. Frequent reversal of flow is necessary for the successful operation of multiple compartment tanks, and it is important to obtain nearly equal distribution of solids among the several tanks.

There appeared to be a decided advantage in greater depth of tanks in preventing excessive scum formation and in providing sludge with a comparatively large proportion of solids. It was found that in the design of the digestion compartment consideration should be given to the probable density and corresponding volume of the sludge as it will lie in the tank.

A list of needs for research is presented, which includes, among other things, the kind and functions of the organisms predominating in the sludge and scum compartments.

The pentration of bacteria through capillary spaces.—II, Migration through sand, S. Warren and S. Mudd (*Jour. Bact., 9 (1924), No. 2, pp. 143–149*).—In a contribution from Harvard University studies are reported which resulted in the development of a method of allowing bacteria to migrate through sand, by which microorganisms of very high motility may be selected. Each strain of bacteria reaches a certain maximum level of activity, which is retained only so long as rapid transfers are made. The method is also adaptable for separating motile and nonmotile organisms. The maximum rates of migration through quartz sand attained by the different organisms tested were for *Vibrio cholerae* 0.55 cm. per hour, and for *V. percolans* 0.43 per hour. These organisms were found to be subject to positive chemotaxis to nutrient media, and their migration to be determined primarily by the available food supply.

RURAL ECONOMICS AND SOCIOLOGY.

Why some farms pay, P. E. McNall (*Wisconsin Sta. Bul. 364 (1924), pp. 23, figs. 7*).—A survey of about 300 farms in Walworth County, within a radius of 6 miles of Elkorn, Wis., was carried on from May, 1920, to May, 1921. Data for the farm business analysis were obtained from 262 farms, and dairy enterprise studies apply to 236 of this number. Approximately 80 per cent of the farmer's income in this area was from the dairy herd, 76 per cent of this having been from milk and 4 per cent from the sale or increase of young stock. The average labor income for the year was —$595. There was an average decrease in the real estate valuation of $1,868 and in livestock valuation of $734 per farm. The labor incomes on the profitable farms varied from $318 for farms of less than 60 acres to $819 for those of more than 180 acres. The farms in the latter size group which lost money failed to pay all expenses and interest by the sum of $1,858 a farm, while the group of smallest farms in the same situation had an average labor income of —$259.

The farms which had but one source of income returning $100 or more had an average farm income of $415. The farms having five or more sources of income had an average farm income of $1,504. As the farms increased in size the number of sources of cash income from the farm also increased. The profitable farms of each group averaged from one-third to one and one-fifth enterprises more per farm than the unprofitable farms in the same group.

There were 48 farms which received between 15 and 30 per cent of their income from crop sales, and their average farm income was $874. The 22 farms which received between 30 and 45 per cent of their income from crops had an average farm income of $1,025. The group having crop yields of 111 to 130 per cent better than the average had an average farm income of $1,104.

The 100 farms whose herds produced less than 5,000 lbs. of milk per cow annually had an average farm income of $476, the 129 farms having herds whose production ranged from 5,000 to 7,000 lbs. per cow averaged $1,087 farm income, while the 33 farms whose herds produced more than 7,000 lbs. per cow annually received $1,205 income. It is indicated that as the production per cow increased 80 per cent the total costs increased approximately 25 per cent. The value of feed and labor required and building and equipment costs increased at about the same rate, yet in spite of the greater care, shelter, and feed per cow the better producing herds produced milk more economically.

There were but 19 herds classed as purebred, and their production was slightly less than 5,500 lbs. per cow. The grade herds averaged approximately 6,200 lbs. per cow, while the scrub herds averaged but 4,800 lbs.

When the feed, labor, and other requirements were expressed in dollars and cents it was found that the herds averaging more than 7,000 lbs. of milk per cow produced at a cost of 40 cts. per hundredweight less than did the herds whose production was betweeen 5,000 and 7,000 lbs. and $1.19 less than those herds whose production did not exceed 5,000 lbs. per cow. The net returns per cow were practically the same for the herds which received between 1,000 and 2,000 lbs. of concentrates per cow as in those receiving less than 1,000 lbs., and were $54 per cow larger than the average of those herds receiving the heaviest grain and other concentrate ration.

Other differences between the requirements of herds of low and high returns per dollar are brought out in detail. Although not all high producers were efficient producers, the group of most efficient ones was from the high producing group and the costs per hundredweight of milk produced were much lower than those of the less efficient herds.

Investigations with reference to the returns from agriculture in 1921–22 [trans. title], E. Laur et al. (*Ann. Agr. Suisse, 24 (1923), No. 2, pp. 113–198; 25 (1924), No. 1, pp. 1–115*).—These pages present current information with regard to the returns of agriculture in Switzerland, supplementing the report previously noted (E. S. R., 48, p. 187).

Grass culture as a factor in production in modern agriculture [trans. title], A. Elofson (*Nord. Jordbrugsforsk., 1923, No. 5–8, pp. 32–43*).—In a general discussion of this subject in a paper presented at the congress of the Scandinavian Agricultural Research Union held in Goteborg in 1923 reference is made mainly to conditions prevailing in Sweden. Statistical data given show that in that country the pasture lands comprise about 3,360,000 acres and the meadow lands approximately 2,300,000 acres. It is pointed out that in addition to these areas about 2,500,000 acres of native grasslands, partly included in the forests of the country, are capable of improvement and utilization. The yielding capacity of the meadow lands in terms of hay and nutritive value and the botanical composition of the flora of unimproved grasslands are briefly noted. The use of fertilizers and of legumes in meadow culture is considered, and the economic results of the extended use of grasslands, especially in their relation to the raising of young stock, are discussed.

The economy of root crop production [trans. title], O. H. Larsen (*Nord. Jordbrugsforsk., 1923, No. 5–8, pp. 47–65*).—In a paper presented at the congress of the Scandinavian Agricultural Research Union held in Goteborg in 1923 data are given showing the development of root-crop culture in the Scandinavian countries, including Finland, and the comparative cost of producing grain, root crops, and grass and soiling crops in various localities in Denmark at different periods from 1910 to 1922. It is shown that root crops gave lower financial returns than those secured from grain and grass crops, and much of the discussion is devoted to explaining why, in spite of this fact, root-crop culture in Denmark is on the increase.

The amount of livestock on large and small farms in Sweden [trans. title], E. Höijer (*K. Landtbr. Akad. Handl. och Tidskr., 61 (1923), No. 5, pp. 361–376, figs. 4; abs. in Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 1*

(*1923*), *No. 1*, *pp. 198, 199, fig. 1*).—Data obtained in 1919 in a census of the domestic animals in Sweden are presented here. The number of animals per 100 hectares of crop land was estimated for each size group of farms.

It is shown that horses were used most and most cheaply on the large farms. Stock breeding was much more intensive in areas where small holdings are the rule than in districts where the land is in the hands of a few large proprietors. The number of livestock per person engaged in agriculture was much less on the small farm than on the large. The latter is not only superior in this respect to the small farm but also to the large landed property.

The six-horse-team unit: Cost of upkeep in Canterbury, E. J. Fawcett (*New Zeal. Jour. Agr.*, *27* (*1923*), *No. 6*, *pp. 355–364*, *fig. 1*).—In making this investigation of the cost of maintaining a six-horse team for one year and the cost of cultural operations per acre, 27 farmers in Canterbury Province, New Zealand, were visited by the author and the information obtained by questionnaires. Annual expenses are recorded for each farm under 19 headings, including interest on the invested capital, feed consumed, current expenses, repairs, and depreciation. Variations in the estimates of items carrying interest and a summary of expenses are given.

The spread or variation of expenses in the final yearly estimates was from £762 4s. 5d. to £446 7s. 5d. This amounted to a variation of from 139 to 81 per cent from the average cost of upkeep on a six-horse team of £548 5s. 8d. per year. An extra horse kept for relief work is estimated to cost £44 4s. per year in interest, depreciation, feed, shelter, and shoes, bringing the total annual cost of seven horses to £592 9s. 8d. The cost of horses, teamster, and interest, depreciation, and repairs is estimated at, respectively, 48, 32, and 20 per cent of the total daily cost of £2 3s. 10d.

The cost of tillage operations per acre is shown.

The business management and profits of beekeeping in 1922 [trans. title] (*Landw. Jahrb. Schweiz*, *37* (*1923*), *No. 5*, *pp. 555–579*).—Records from the account books of 84 beekeepers in Switzerland for 1922 are summarized and analyzed as exhibiting the capital investment, income and outlay, contribution to household expenses, labor requirements, gross and net returns, and other items. Data for each year from 1912 to 1922, inclusive, are summarized.

Relation of land income to land value, C. R. Chambers (*U. S. Dept. Agr. Bul. 1224* (*1924*), *pp. 132*, *figs. 7*).—Data collected in the census of 1920 constitute the basis of this study, and average sale prices of farm land, as well as average values based on sale prices stated in deeds, are used as a check on census information. Such data were obtained from tax commissions and private sources and from some special studies. Altogether 154,653 cash-rented farms in 567 counties are involved. The counties are grouped into about 48 areas and then into districts, roughly showing an economic and general physical uniformity. In order to study the long-time relationship between land income and land value, further data were obtained from a questionnaire sent to cash-renting landlords and other data by way of comparison were obtained in part from recorded deeds and in part from estimates of the Crop Reporting Board, U. S. D. A.

It appears that in general the high-value areas are the high-rent areas, and the low-value areas the low-rent areas, but this is true for the whole country only in a very general way. The ratios of cash rent to land value by counties based upon gross rents and values of the one-year tenant farms after all cases of kinship between landlord and tenant had been eliminated show wide variations between the groups and small variations from county to county within each group.

With respect to the degree of accuracy of the data and the normality of the relationship between cash rent and land value in 1920, it was found that the ratios of rent to value were not very reliable for individual counties but were highly accurate for groups of counties. In regions where the land boom had been most active the census valuations of land were biased above actual sale prices. It was found that from year to year the ratio of rent to value was remarkably consistent in four important areas, but that in 1920 land values advanced more rapidly than cash rents, making the ratios of rent to value in that year lower than normal by as much as 0.5 per cent in Iowa, and it is held likely that the spread between cash rents and land values was greater in this area than in any other. The relative variations in the ratios of rent to value for the different parts of the country were not due to abnormal fluctuations in rents or values in those regions. In other words, the regional variations in the ratios as shown by the census data are deemed typical of other years.

Net cash rents and their relation to land value were examined on the basis of data available in 9 of the 48 groups. Net rents were derived by deducting the average tax per acre and depreciation and repair of improvements from gross rents. After this operation a large part of the variation was found to be still present, and the factors determining the relation of land income and land value at a given time are examined in detail. In new agricultural regions the expected increase in income is said to be in the main probably based on prospective improvements in the type of farming, transportation, and drainage or clearing, but in the old areas, which constitute the major farming regions of the United States, the expected changes in land income are based in the main on average changes in the past. The buyers and sellers of land in 1920 based their estimates of the worth of land on its earning power in 1920, and the average increases in this earning power in the years preceding 1920, in much the same way that buyers and sellers in 1910 had done. The land incomes on which these buyers and sellers based their estimates of value were less sound than those in 1910 in the sense that they were the result of war conditions and could not continue.

A downward trend in the ratio of cash rent to the value of the land between 1900 and 1920 is brought out. In discussing the anticipated rate of return on investments in farm lands, a rate of capitalization was assumed as the mortgage rate of interest. The psychology of both buyers and sellers of farm lands is considered. Buyers are said not to think in terms of alternative investments while certain sellers do, and the action of the latter keeps the rate of return on farm lands in equilibrium with the rates on other investments. The anticipated rate of return can not depart very far from the mortgage rate of interest when farm mortgages are readily available to a large class of potential sellers of land.

The actual rate of return on investments in farm lands is found to have increased between 1910 and 1920 by more than the expected 7 cts. a year, but it is doubted whether investors in 1910 will receive over a 40- or 50-year period as great returns as they expected.

Cash rent as a measure of land income is analyzed under the heads of the relation of cash rent to farm rent, the influence of kinship between landlord and tenant on cash rents, the influence of race, the relation of the period of occupancy, and the effect of inadequate improvement. There is said to be a tendency for cash rents and farm rents to be maintained in equilibrium. The last section of this study is devoted to a brief discussion of its bearing on tenancy problems and on land valuation for purposes of mortgage credit. Detailed statistical data are presented in the appendix (pp. 70–181).

California farm tenancy and methods of leasing, R. L. ADAMS (*California Sta. Circ. 272 (1923), pp. 48, fig. 1*).—Data concerning the tenant situation as it affects the social and economic welfare of California, as well as the leasing methods in use in various agricultural sections in the State and in connection with various types of agriculture, are brought together here, based upon detailed intensive studies made in selected districts; the collection of farm leases in actual use obtained from tenants, owners, and county records, a total of 407 having been secured; studies of the more recent findings concerning farm tenancy as shown by investigations in other States; and field surveys in 27 counties conducted by means of questionnaires, conferences, and discussions with local people so situated as to be in touch with the tenancy situation in their sections.

Outright renting or leasing of orchards and vineyards is said to be the exception rather than the rule. Fruit properties when leased are usually more closely supervised than are leased lands devoted to livestock or to grain, hay, and other field crops. Orchard and vineyard leases follow a fairly uniform type, no marked differences occurring as between one kind of fruit and another, and they are usually on the share basis. Leases for field crops, including grains, such as barley, wheat, oats, and grain hay, alfalfa, beans, sugar beets, corn, rice, cotton, and hops, are discussed separately. The leasing of dairies or land for dairying purposes is widespread, both cash and share methods being followed. Land for truck crops is leased under both cash and share methods, as are also strawberry lands. Very little leasing of poultry farms is practiced. The majority of ranges and livestock ranches are leased for cash, the landlord furnishing land and sometimes buildings, fences, and stock water.

The local leasing methods practiced in the Sacramento and San Joaquin deltas, two groups of islands situated at the mouths of the rivers of the same names in varying stages of reclamation and development, are noted particularly. General provisions common to farm leases are listed, and the items to be considered in drawing up leases of several types are suggested. A sample lease form is shown.

Cash and share renting of farms, A. H. BENTON (*North Dakota Sta. Bul. 171 (1924), pp. 51, figs. 10*).—The purpose of this study was to consider methods of renting land and equitable leases where the landlords and tenants were bearing varying proportions of the costs of the farm business. Data for maps and charts were secured from U. S. Census figures. The discussion of rental systems and leases is based on correspondence with farmers concerning rental problems and personal interviews with landlords and tenants in various parts of North Dakota. The cost of production analyses are based upon data compiled by the farm management department for farm crops in North Dakota taken from four areas—the Red River Valley, central North Dakota, and the northwestern and southwestern sections of the State. The distribution of the expense of producing wheat under the most customary half and fourth share arrangements are tabulated. The division of expenses between landlord and tenant producing corn silage and potatoes on grain farms and on mixed grain and livestock farms is specifically outlined. Cases where father and son are operating the home farm on shares and the reimbursement of outgoing tenants for work done on the land in preparation for the next season's crop are dealt with. The system of share tenancy devised by a farming corporation in Cass County, N. Dak., between 1875 and 1922 is set forth in detail to show particularly how the landlord and tenant fared under the tenancy plan used up to 1922 when the land was divided among the owners. The text is given of the farm contract used by this company, as well as of the farming specifications set up for the farmers on its lands.

Several typical lease forms for North Dakota are suggested, and a mixed livestock and crop share lease agreement formulated by C. L. Wendt is reproduced.

Provident land clubs in Spain (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 1 (1923), No. 3, pp. 375–389*).—A detailed account is given of the function and operations of certain of these mutual insurance societies through which a certain area of land is cultivated by the members in common or divided into parcels, rented, or farmed by a manager or by any other convenient method. The characteristic feature of this scheme is that the produce instead of being divided among the members for immediate requirements is reserved to meet future needs and various purposes of social thrift. The members provide in common the raw material and implements of production, offer their collective work, and set aside the proceeds of their labor to the same objective.

The co-operative movement as affecting agriculture (*India [Dept. Agr.] Rev. Agr. Oper., 1922–23, pp. 85–92*).—This is a brief review of operations and increases in membership and funds in the year 1922–23.

Organization and development of a cooperative citrus-fruit marketing agency, A. W. McKay and W. M. Stevens (*U. S. Dept. Agr. Bul. 1237 (1924), pp. 68, figs. 9*).—This bulletin describes the organization and traces the development of the exchange system. The services which the organization has rendered the citrus-fruit industry and the fundamentals upon which it is based are analyzed and discussed. The operation of the exchange and its constituent locals is briefly presented. The exchange system is based upon the principles of operation for mutual benefit, limitation of membership, participation of members in all affairs of the associations, conservative practices, cooperation with other agencies, the privilege of withdrawal, and the encouragement of membership loyalty. In the appendix are given copies of rules and regulations, together with some statistics of citrus-fruit production and shipments.

The report of the Agricultural Organization Society for the year ended 31st March, 1923 (*Agr. Organ. Soc. [London] Rpt., 1923, pp. VI+45*).—This continues the series of annual reports previously noted (E. S. R., 49, p. 93).

The movement of farm population, E. C. Young (*New York Cornell Sta. Bul. 426 (1924), pp. 95, figs. 7*).—Data were obtained for this study by means of surveys in Jefferson, Tioga, Tompkins, and Livingston Counties, N. Y., including 1,110 farms. Other sources of information were the Federal census reports from 1840 to 1920, mortality and birth statistics of the U. S. Census Bureau, the Census of the Agricultural Resources of New York for 1917 and 1918, and estimates of the movement of farm population in New York obtained by the U. S. Department of Agriculture.

The study of the movement of farm population from farms in New York from 1917 to 1920 showed that men and boys were leaving New York farms during that period at about two and one-half times the rate at which they were being produced. The attraction of one community for persons in other communities and such considerations as physical barriers, railroads, and highways are said to greatly influence the rate and direction of movement. The important factors determining the element of the farm population that will leave the farm are opportunity, the size of farms, education, distance, age of individuals, and capital. For the persons included in this study the rate at which men left the farm changed from 12 per cent for those born between 1830 and 1839 to 56 per cent for those born between 1890 and 1899. The rate at which women left the farm changed from 12 per cent for those born between

1830 and 1839 to 60 per cent for those born between 1890 and 1899. Persons are said to leave the farm in the order of hired man, farmer's son, share tenant, cash tenant, and owner.

The movement of population to farms is not so large as the movement from farms, and increases and decreases inversely to the movement away from farms.

Forty-four per cent of the farm operators in this study, 29 per cent of their wives, 24 per cent of their fathers, and 14 per cent of their wives' fathers were born in the township in which the operator resided. Eighty-one per cent of the operators, 78 per cent of their wives, 51 per cent of their fathers, and 49 per cent of their wives' fathers were born in New York State. Nineteen per cent of the hired men, 14 per cent of their wives, 7 per cent of their fathers, and 5 per cent of their wives' fathers were born in the township in which the hired man resided. Sixty-seven per cent of the hired men, 62 per cent of their wives, 34 per cent of their fathers, and 42 per cent of their wives' fathers were born in New York State. On the average, persons who were born in the township of their residence were farther up the agricultural ladder than those who were not. A study of the net farm profit of 699 Livingston County farmers showed that the men who stayed on their fathers' farms had profited financially. Those who had always been on farms were better off than those who had tried some other occupation for a year or more. An estimate of the net movement of men and women from farms showed that that of men from farms had changed from 14 per cent for men born between 1860 and 1869 to 24 per cent for men born between 1890 and 1899, and that the net movement of women from farms had changed from 14 per cent for women born between 1860 and 1869 to 25 per cent for women born between 1890 and 1899.

Apparently, farmers' sons can not be expected to stay with their fathers after they are 25 years of age without some share in the business, and by the time they are 35 they expect to take over the business either as tenant or as owner. In Livingston County the median age of marriage for all married farm operators was 27 years. The median of becoming a tenant was 26 years, and that of becoming an owner was 32 years for owners who had always been on farms and 37 for owners who had worked in some other occupation for a year or more.

The report of the cotton service to the minister of agriculture, industry, and commerce [of Brazil] [trans. title], W. W. COELHO DE SOUZA (*Min. Agr., Indus. e Com. Serv. Algodão [Brazil] Relat., [1921], pp. 283, pls. 4, figs. 15*).—Statistics are presented in this annual report of the official cotton service of the Ministry of Agriculture for Brazil, setting forth the exports of cotton, imports of cotton waste, and miscellaneous items through recent years. Notes are submitted covering various phases of cotton production and official encouragement of the industry in the important cotton-growing regions in Brazil.

The Price Current-Grain Reporter Year Book for 1923, E. G. OSMAN (*Chicago: Price Current-Grain Rptr., 1923, pp. 112*).—Current grain and provision trade statistics, together with crop statistics, imports and exports, and other items, are given as in the earlier year (E. S. R., 47, p. 597).

AGRICULTURAL EDUCATION.

Suggestions for conducting conferences with college instructors on methods of teaching, H. H. GIBSON (*Vocat. Ed. Mag., 2 (1924), No. 9, pp. 715-718*).—The author offers suggestions which he has developed from his experiences with conferences on teaching methods with college instructors in agriculture. An outline is presented covering the subject matter developed and suggested topics for later discussions, and points to be considered in organizing subject matter with reference to training students in reflective thinking.

[Agricultural and home economics schools] (*Ztschr. Sächs. Statis. Landesamt., 69 (1923), pp. 130, 131, 138*).—A statistical report is submitted setting forth the number and enrollment, as well as some of the courses offered, in agricultural, horticultural, and garden schools and schools of farm home economy under official supervision in Saxony.

Selection and training of part-time homemaking teachers, M. JOHNSTON (*Vocat. Ed. Mag., 2 (1924), No. 9, pp. 744–746*).—It is thought that a young teacher who is inclined toward social service and appreciates the point of view of young girls should become a good part-time teacher. Adequate training in home making subjects and practical experience are deemed necessary. The ideal teacher-training experience as suggested here would include a two years' home economics course, a year of practical home-making experience, and a short period of employment in industry, followed by courses in economics, sociology, history of industry, vocational guidance, mental hygiene, the psychology of adolescence, and administration of the part-time school.

Organised day courses in agriculture (*Jour. Min. Agr. [Gt. Brit.], 30 (1924), No. 12, pp. 1142–1147*).—These are designed primarily for students of ages from 16 to 35 whose opportunities for instruction are both limited and seasonal. A syllabus for a course in agriculture is drawn up under the three heads of crop husbandry, animal husbandry, and farm mangement, and brief syllabuses for horticulture, dairying, and small livestock are shown.

Lessons in agriculture, F. TODARO (*Lezioni di Agricoltura. Casale Monferrato, Italy: Marescalchi Bros., 1924, vol. 1, 3. ed., rev., pp. XI+609*).—This is a text and handbook in general agriculture based upon courses offered at the School of Agriculture at the University of Bologna.

Soils and crops, J. H. GEHRS (*New York: Macmillan Co., 1924, pp. VIII+444, figs. 224*).—This text is intended as a companion volume to one noted earlier (E. S. R., 48, p. 497). The subject matter is presented in three parts covering, respectively, soils, crops, and horticulture.

Plant pathology in the public school, W. A. MCCUBBIN (*Sci. Agr., 3 (1923), No. 9, pp. 319–321*).—The need is stressed for adequate comprehension of the main facts and fundamental concepts regarding plant disease by audiences and readers, and the necessity, to this end, for such instruction in schools as will insure adequate and intelligent grasp of presentations on this and related subjects, with a brief account of a scheme for introducing some fundamental instruction on plant diseases in the State of Pennsylvania. The plan in question is outlined.

Teaching a required poultry course, A. G. PHILIPS (*Poultry Sci., 3 (1923–24), No. 2, pp. 65–71*).—A method of conducting the freshman course is set forth.

The background of economics, M. H. HUNTER and G. S. WATKINS (*New York and London: McGraw-Hill Book Co., Inc., 1923, pp. X+514, fig. 1*).—The principles of economics are presented by first setting forth as a background the familiar phenomena of the student's environment. A general survey is given in eight parts, dealing with man and society, the forces of nature, the products of nature, agriculture, manufacturing industry, the problems of industry, exchange, and government and economic relations. The book is written particularly for students who have completed high school courses in social science and are preparing to take up college courses in economics.

Elements of land economics, R. T. ELY and E. W. MOREHOUSE (*New York: Macmillan Co., 1924, pp. XVIII+363, pls. 9, figs. 7*).—Much of the subject matter of Volume I of a series of mimeographed studies previously noted (E. S. R., 48, p. 787) has been incorporated in the first nine chapters of this, which is Volume II of a standard course in real estate outlined by a joint commission representing a number of cooperating bodies interested in real estate education. Chapter 10 and the following ones deal with ownership of land, land credit, land values and valuation, the social ends of land utilization, and policies of land settlement and development and land taxation. A bibliography arranged with special reference to chapters 2 to 15 is presented. Some statistical material is included in the appendix.

Geography in France, E. de Martonne (*Amer. Geogr. Soc., Research Ser. No. 4a (1924), pp. VII+70*).—This is an account of the development and status of geographical societies and kindred institutions, the teaching of geography in the universities, the Government departments contributing to geography, and the leading geographical journals and series in France.

Applied art in home furnishing and decorating, A. Holman (*Kans. Agr. Col. Ext. Bul. 43 (1923), pp. 61, figs. 31*).—Certain elementary principles of decoration, color, line and form, and arrangement are set forth and illustrated. A score card for home judging is drawn up, references are listed, and a few considerations in the selection, framing, and hanging of pictures are given.

Child health program for parent-teacher associations and women's clubs, L. W. Collier (*U. S. Bur. Ed., Health Ed. No. 5, rev. ed. (1924), pp. IV+22, figs. 10*).—An earlier bulletin has been revised by H. Wedgwood, and an entirely new bibliography has been drawn up.

Cotton growing, W. H. Sachs et al. (*Ark. Agr. Col. Ext. Circ. 160 (1924), pp. 12*).—This is a manual recommending the best practices of growing, handling, and marketing cotton by club members.

Growing early Irish potatoes, C. Woolsey (*Ark. Agr. Col. Ext. Circ. 159 (1924), pp. 9, figs. 4*).—This is a manual dealing with the growing and handling of potatoes by club members.

Sow and litter club, J. M. Burch and T. T. Martin (*Missouri Agr. Col. Ext., Boys' and Girls' Club Circ. 11 (1924), pp. 32, figs. 14*).—This circular presents some of the basic facts in pork production for club members.

Kansas dairy club manual, M. H. Coe and C. R. Gearhart (*Kans. Agr. Col. Ext. Bul. 44 (1924), pp. 40, figs. 16*).—This is a general handbook for club members.

Dairy calf clubs, E. M. Harmon and T. T. Martin (*Missouri Agr. Col. Ext., Boys' and Girls' Club Circ. 12 (1924), pp. 38, figs. 11*).—This is a manual for use by members of the junior calf club, the bred heifer club, and the cow testing club.

4-H dairy club manual, J. W. Boehr (*Okla. Agr. Col. Ext. Circ. 173 (1923), pp. 12, fig. 1*).—Directions are given for the choice and care of animals for dairy club demonstrations.

Suggestions for work of home demonstration clubs, M. Wilson (*Wash. State Col. Ext. [Bul.] 110 (1924), pp. 15*).—Suggestions are offered with reference to programs, celebrations and special days, and matters of organization.

MISCELLANEOUS.

Publications available for free distribution (*Idaho Sta. Circ. 36 (1924), pp. 4*).—The station and extension bulletins and circulars available for distribution are listed.

The Quarterly Bulletin [of the Michigan Experiment Station], edited by R. S. Shaw and E. B. Hill (*Michigan Sta. Quart. Bul., 6 (1924), No. 4, pp. 145–198, figs. 17*).—In addition to articles abstracted elsewhere in this issue and an index to Volumes 5 and 6, this number contains an article entitled More Efficient Pasteurizing Plants, by L. H. Cooledge.

NOTES.

Delaware University and Station.—P. B. Meyers has been appointed chemist of the station vice L. W. Tarr, resigned. A. E. Tomhave has been transferred from the college to the station staff as animal husbandman vice T. A. Baker, who will devote his entire time to teaching.

A scholarship has been established in the station by J. N. Hoff of New York City on the subject of treatment of peat for crop production. Paul H. Mantz has been appointed to this scholarship.

Michigan College and Station.—Dr. Kenyon L. Butterfield assumed the office of president September 1. Dean R. S. Shaw, acting president since June 1, 1923, has resumed his duties as dean of the agricultural division, which by recent action of the State Board of Agriculture now embodies the extension division as well as the resident instruction in agriculture and the work of the station.

A dining hall 128 by 40 ft. in size and accommodating about 400 persons has recently been built at the Upper Peninsula Substation at Chatham. The main purpose of this building is to furnish accommodations for the boys and girls who attend the annual club camps at the substation.

Through recent action of the State Board of Agriculture, the testing of poultry for bacillary white diarrhea, which for the past year has been done free of charge, will now be made for a nominal fee sufficient to pay for the major part of the expense involved. It is expected that this will be a temporary expedient to handle the situation until local veterinarians will be able to take over the work.

Further emphasis will be given this year to a new station project in biological chemistry which is to determine the effect of hydroquinone and related compounds on animal metabolism. A half-time graduate assistant and a special appropriation have been assigned for this work, in which some very interesting results have already developed.

The appropriation for research in the marketing of agricultural products has been considerably increased over that for the previous year.

Frank A. Spragg, associate professor of farm crops and research associate in crop breeding, was killed in an automobile accident August 11, together with his wife and one of their three children. Professor Spragg was born at Hazleton, Iowa, in 1874, graduated from the Montana College in 1902, and received the M. S. degree from the Michigan College in 1906. In the following year he became instructor in farm crops and expert in plant breeding in the latter institution, continuing in this service until his death, much of his work being in collaboration with the U. S. Department of Agrculture. He was widely known for his success as a plant breeder. Among the crop varieties developed by him were Rosen rye; Red Rock and Berkley Rock wheat; Wolverine, Alexandria, Worthy, and Success oats; Robust bean; Mich-two-row and Black Barbless barley; and Hardigan alfalfa. He had also done considerable plant breeding with other crops, notably hemp, sugar beets, corn, and sweet clover.

Rhode Island College and Station.—Herman E. Segelin has been appointed instructor in bacteriology in the college and assistant in animal breeding and pathology in the station.

EXPERIMENT STATION RECORD.

Vol. 51. November, 1924. No. 7.

With the passing of the years the need of attention to the historical aspects of agricultural science becomes more and more important. Fortunately, this need is becoming quite clearly recognized While a complete and authoritative account of the upbuilding of agricultural education and research in this country has yet to be published, annals and reminiscences on various phases of the subject have been appearing of late in considerable numbers, and others of much prospective value are known to be in preparation.

An unusual number of the current contributions to agricultural history have dealt with the Federal Department of Agriculture. Reference was made in these columns not long ago to the useful series of monographs on a number of the bureaus of the Department and other units of the Federal Government which is being issued. Another newcomer in this field is what is termed by its authors a sketch of the Bureau of Animal Industry, its establishment, achievements, and current activities. This account, constituting a volume of some four hundred pages, was prepared by members of the bureau's staff in commemoration of the completion of its fortieth year of service. The book, which is semi-official in nature, assembles important data scattered through a wide range of publications or hitherto unpublished. In so doing, it not only preserves and perpetuates this information in convenient form, but it places on record in a comprehensive way much that is of general interest.

It appears that, despite the importance of the animal industry in American agriculture, not for many years after the establishment of the Federal Department was action taken by the Government to give assistance to livestock raisers further than by the publication in the annual reports of occasional articles on livestock production and the care of animals. In 1869 Commissioner Capron recommended the establishment in the Department of a division of veterinary surgery, and this recommendation was subsequently renewed until in 1883 a Veterinary Division was organized.

At that date it is estimated that there were on the farms of this country a total of 146,388,329 animals valued at $2,338,241,519. Yet we are told that up to that time "the livestock industry had been left to drift without much beneficial assistance from either State or National Governments. Contagious pleuro-pneumonia had existed along the Atlantic coast for 50 years. From 25 to 30 million dollars' worth of hogs were dying each year from hog cholera. Sheep raising had become precarious in many sections of scab and other parasitic diseases. Tuberculosis and contagious abortion were spreading. Anthrax and blackleg were on the increase in most of the States. Cattle raisers were in a state of consternation from fear of Texas fever. The causes of the most destructive animal diseases were unknown or in dispute, and livestock owners were defenseless, as veterinary science had not been able to provide effectual prophylactic or medicinal treatment. Vexatious and expensive quarantines were increasing for protection and retaliation. Our system of interstate and export animal transportation was denounced as a disgrace and an outrage on the first principles of humanity. There was a growing demand for protection of the public health in connection with the meat supply. Our export cattle and sheep were denied admission into Great Britain and were condemned to slaughter within a limited time on the docks where they landed, and our pork had been prohibited entrance into most of the markets of continental Europe. There was urgent need of reliable official information concerning the nature and prevalence of animal diseases and of the means required to control and eradicate them."

The Veterinary Division, when instituted, was primarily a research organization without executive authority, the only powers exercised by the Federal Government to check animal diseases being through the quarantine of imported cattle by the Treasury Department. With a view primarily to combating outbreaks of contagious diseases and specifically to meet the objections raised abroad to the admission of American cattle, an act of Congress was approved on May 29, 1884, establishing within the Department of Agriculture a Bureau of Animal Industry.

The immediate purposes for which the new bureau was created are indicated by the title of the act as to prevent the exportation of diseased cattle and to provide means for the suppression and extirpation of pleuropneumonia and other contagious diseases among domestic animals. The bureau was further restricted by a provision that its force should not exceed 20 persons at any time and by an initial appropriation of $150,000. When comparison is made with the present broad scope of the work, with its 14 divisions and offices, its average personnel of about 4,500 employees, and its appropriations aggregating for the present fiscal year over $10,000,000, in addition to emergency allotments, the developments of 40 years can be readily visualized.

The first undertaking with which the bureau was confronted was the campaign against contagious pleuropneumonia. Previous efforts of the State and Federal Governments had not proved effectual, and by 1884 this disease had spread to seven Eastern States and the District of Columbia, and not long afterward it was reported from Illinois, Missouri, Kentucky, and Delaware. After about five years and an expenditure of slightly over $1,500,000, complete eradication was reported. This was regarded as a remarkable accomplishment for the times. In the words of the historical account, "the United States was the first of the large nations of the world up to that time which, having been once extensively infected with contagious pleuropneumonia, was able to extirpate it completely. When it is considered that there were grave doubts entertained of the possibility of eradicating pleuropneumonia, that the States were not prepared to cooperate effectively, that serious opposition was met on almost every hand, and that other countries had labored a much longer time and made greater expenditures of money without success, the favorable outcome must be regarded as a great achievement for the new Bureau of Animal Industry. It accomplished the first great thing it undertook, the paramount purpose for which it was created."

The function of the bureau as a protection against the introduction of further animal diseases from abroad was among the first of its routine activities to be developed. Soon after its establishment the quarantine stations for imported cattle were transferred to its jurisdiction, and a comprehensive system of inspection was gradually put into operation. The success of this system is attested by the fact that no outbreaks of contagious diseases have since been traceable to import livestock or products over which the bureau maintains supervision. On the other hand, it is known that threatened invasions of Malta fever, surra, and other pests have been definitely prevented.

Another important service early begun by the bureau was its inspection of export animals, meat, and meat products. Prior to the undertaking of this work, restrictions of increasing severity were being imposed by foreign countries, some of which were hampering American trade quite seriously. Aided by additional legislation, notably the meat-inspection acts of 1890 and 1891, the bureau was enabled to undertake a system of meat inspection, which not only achieved its immediate economic objects of meeting foreign requirements, but ultimately led logically to its extension as a national service in hygiene for the protection of domestice consumers.

The passage of the meat-inspection act of 1906 broadened the scope of the inspection and subsequent amendments followed in due course, causing a material expansion in the bureau's work. As at present organized, the Federal meat inspection service is by far the largest and most comprehensive of its kind in the world. In 1923 73,000,000 animals were inspected, and over 7,000 tons of meat were condemned for use for food purposes. The inspection force numbered nearly 2,500 employees, of whom about 700 were veterinarians.

In consequence of the development of this and other phases of its pathological work, the bureau has been for years much the largest employer of graduates in veterinary medicine, and accordingly it has necessarily taken an active interest in the improvement of veterinary education. An accredited list of institutions whose graduates are eligible to the Civil Service examinations held to enable it to recruit its staff was worked out, and with the cooperation of the leading institutions standards have been gradually but materially advanced and courses and faculties greatly strengthened. It is not too much to assert that as a direct result of the bureau's attitude higher veterinary education in this country has been given an increased impetus which has assisted more than any one factor in elevating the veterinary profession as a whole.

Throughout its history much prominence has been given by the bureau to the combating of the principal livestock diseases of the country. It has successfully suppressed serious outbreaks of foot-and-mouth disease in 1902, 1908, and 1914, the last named of which had spread to 20 States and the District of Columbia, and has recently announced as under control the outbreaks of 1924 in California and Texas. With the cooperation of the States, it has also achieved nearly complete suppression of cattle and sheep scabies, glanders, and dourine.

During the last 10 years special appropriations have been made for the prosecution of field work on hog cholera, and a vigorous campaign has been conducted. It is claimed that many times its cost has already been saved to the swine industry, and that with an enlightened public sentiment and adequate resources this disease can be added to those already successfully eradicated.

In 1917 a separate division on tuberculosis eradication was organized, and an active campaign in cooperation with the States was inaugurated to combat this disease through the establishment of "accredited herds" of purebred cattle and the eradication of tuberculosis from circumscribed areas and from swine. For the fiscal year 1924 appropriations were available of $850,000 for the bureau's operating expenses and $2,027,600 for the payment of Federal indemnities to owners of condemned stock, supplemented by estimated appropriations of $5,000,000 from States or their subdivisions. The substantial progress already achieved may be inferred from the existence in 1914 of 37,389 accredited herds aggregating 784,975 purebred cattle, while 438,284 herds of 3,812,859 cattle had received the initial test provided. The demand for this work has continued to increase, there being on October 1, 1924, a waiting list of 248,558 herds of approximately 2,681,543 cattle.

What is characterized as "one of the greatest and most beneficial undertakings in which the bureau has engaged" has been the campaign for tick eradication. As early as 1883 attempts to establish the northern boundary of Texas fever were begun, and the first quarantine order was issued in 1889. Soon afterward the connection of the cattle tick with the disease was demonstrated. This discovery proved of far reaching application to other dreaded diseases, and also pointed the way toward successfully combating Texas fever. An active campaign of eradication was instituted in 1906, at which time 975 counties in 15 States were under quarantine. Seventeen years later 695 of these counties had been released, of which 458 counties were regarded as tick free. The economic benefits from this work have been enormous, the introduction of improved livestock into the South making possible the development of beef and cattle industries of large proportions, and these in turn proving a potent factor in the upbuilding and diversifying of the agriculture of the region.

As has been shown, the undertaking of experimental work in animal diseases antedated the creation of the bureau itself. Special mention should therefore be made of the Bureau Experiment Station, first opened in 1883 and since 1897 operated at its present location at Bethesda, Md. To this institution much credit is given for its constructive findings. These have covered a wide range of diseases, among which Texas fever and its relations with the cattle tick, swine plague and hog cholera, and tuberculosis may be mentioned as outstanding. Reference should also be made to the studies organized by the bureau under its Pathological, Zoological, and Biochemic Divisions and to the work of the Division of Virus-Serum Control.

Although the early activities of the bureau were directed quite predominantly along pathological lines, the need of improved methods of animal production was increasingly recognized, as well as the opportunities for national leadership in the development of the industry. In 1895 the Dairy Division was organized. Its first efforts were largely educational, consisting chiefly of the collecting and disseminating of information relating to dairying as carried on in the United States and foreign countries. Gradually experimental work was introduced, the dairy research laboratories being established in 1902 and studies begun with market milk in 1905 and dairy manufacturing in 1906. An experimental farm was acquired in 1910, and investigations in cattle breeding instituted the following year. Considerable work in dairy extension was also carried on. A number of the experimental projects were in cooperation with the State experiment stations, the earliest work in this direction being begun in 1905 at the Connecticut Storrs, Wisconsin, Missouri, and Pennsylvania Stations. On July 1, 1924, special recognition of the dairy interests of the country was given by its reorganization as a separate unit of the department, known as the Bureau of Dairying.

In 1897, two years after the establishment of the Dairy Division, a study was begun in cooperation with Doctor Armsby of the Pennsylvania Station of problems of animal nutrition comparable to those already under way in human nutrition problems by Doctor Atwater and his associates at Wesleyan University. This cooperation continued until 1920 and resulted in the construction of the first respiration calorimeter in this country for work with large animals and in the well-known fundamental investigations with that apparatus. In this connection it is of interest to note the recent transfer to the bureau of the modified Atwater apparatus, removed from Middletown, Conn., to Washington many years ago and of late years operated as a part of the Department's work in home economics.

The first appropriation for animal husbandry investigations by the bureau itself was granted in 1904. Six years later the extensive farm at Beltsville, Md., was purchased, and subsequent development was rapid. Units were organized for work with beef cattle, horses and mules, poultry, sheep and goats, and swine, and ultimately for investigations in animal genetics. Various phases of the animal husbandry work have been carried on in cooperation with the experiment stations and other bureaus of the department. The most recent development has been the organization this summer of the U. S. Range Livestock Experiment Station at Miles City, Mont., under the immediate supervision of the Animal Husbandry Division, in cooperation with the Montana Station and other bureaus of the Department interested in livestock and range problems.

The foregoing review is necessarily both fragmentary and superficial, yet it may serve to illustrate some of the major lines of evolution of the bureau. It may also indicate how research has developed hand in hand with regulatory, administrative, and educational functions, and has provided a sure foundation without which the success which has attended the other phases of the bureau's work could not have been attained. The gradual winning of public confidence in the bureau's undertakings, many of which have entered in a very intimate way into the daily life of the people, has been another notable achievment.

One factor which has doubtless assisted in this and other directions has been the continuity of the bureau's supervisory personnel. The tenure of its first chief covered a period of over 21 years, and in its entire 40 years' history but three men have headed its activities.

These and a host of other interesting details are made available by the historical account now presented to the public. It should prove a useful as well as a timely epitome of the formative period of this important organization.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The atom and the Bohr theory of its structure, H. A. KRAMERS and H. HOLST (*London and Copenhagen: Gyldendal, 1923, pp. XIII+210, pls. 2, figs. 35*)—This volume, which has a foreword by E. Rutherford, deals in a nontechnical manner with the development of modern ideas on atomic structure, with special reference to the Bohr theory of the hydrogen spectrum and its various applications. Ingenious diagrams are appended showing the structure of the radium atom and the main lines of the atomic structure of nine other elements according to the Bohr theory. In these diagrams the nucleus of the atom is shown by a dot, and the orbits of the electrons as circles or ellipses—red to denote orbits with uneven and black those with even quantum numbers.

Colloid chemistry in relation to agriculture, A. J. PATTEN (*Jour. Assoc. Off. Agr. Chem., 7 (1924), No. 3, pp. 189–196*).—In this presidential address, delivered before the Association of Official Agricultural Chemists November 20, 1923, the author discusses, with references to the literature, the applications of colloidal chemistry to dairy problems, the manufacture of fungicides and insecticides, the baking industry, and soil problems, the last named being discussed in greatest detail.

The constitution of polysaccharides, J. C. IRVINE (*Chem. Rev., 1 (1924), No. 1, pp. 41–47*).—In this paper the author has "endeavored to summarize the results of researches which have extended over 21 years so as to display the consecutive evidence upon which the structural representation of polysaccharids can now be based." The stages through which the modern conception of the structure of the hexose molecule is based are first reviewed, after which the following carbohydrates are considered consecutively: The natural glucosids, the disaccharids maltose, cellobiose, lactose, and sucrose; and the polysaccharids cellulose, starch, glycogen, and inulin. In the closing section is summarized the present knowledge concerning the γ-sugars.

The chemical composition of sesame oil, G. S. JAMIESON and W. F. BAUGHMAN (*Jour. Amer. Chem. Soc., 46 (1924), No. 3, pp. 775–778*).—The oil analyzed was obtained by the expeller process from the yellow variety of sesame seed grown in China. A 55.1 per cent yield of oil was obtained of a light yellow color and a pleasant taste and odor. The following physical and chemical constants were obtained: d25/25 0.9187, n^{20} 1.4731, acid value 1.4, iodin number (Hanus) 110.8, saponification value 189.3, unsaponifiable matter (per cent) 1.78, acetyl value 9.8, Reichert-Meissl number 0.11, Polenske number 0.15, saturated acids (determined, per cent) 12.8, unsaturated acids plus unsaponifiable matter (determined, per cent) 82.3, iodin number of unsaturated acids plus unsaponifiable matter 129.0, and iodin number of unsaturated acids 129.7. The distribution of glycerids of the fatty acids was calculated to be as follows: Oleic 48.1 per cent, linolic 36.8, palmitic 7.7, stearic 4.6, arachidic 0.4, lignoceric trace (0.04), and unsaponifiable matter 1.7 per cent.

A chemical study of canned salmon.—I, Variations in composition of the Pacific coast salmon and steelhead trout as influenced by species and locality where caught, O. E. Shostrom, R. W. Clough, and E. D. Clark (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 283–289, fig. 1*).—The results are reported of the analysis of several hundred cans of various species of Pacific coast salmon and of a few cans of steelhead trout and Atlantic salmon. Most of the samples examined were special packs prepared in various canneries, the same section of flesh being used in all cases to eliminate variations in composition due to the use of different parts of the fish. The data obtained are assembled in tables for the same species in different localities, with a final table of general averages given below:

Composition of Pacific salmon, steelhead trout, and Atlantic salmon.

Species of fish.	Number of cans analyzed.	Bone.	Bone-free fish.				
			Moisture.	Protein (N×6.25).	Fat.	Salt-free ash.	Calories per pound.
SPECIAL PACKS.							
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	
Sockeye salmon	126	1.96	67.19	21.14	8.58	1.32	753
Chinook salmon	216	1.78	63.98	19.51	13.41	1.21	928
Coho salmon	99	1.88	67.49	21.08	8.49	1.24	750
Pink salmon	90	2.32	70.05	20.56	6.20	1.31	644
Chum salmon	108	1.87	70.85	21.48	5.15	1.28	615
Average for all species	639	1.96	67.91	20.73	8.37	1.27	738
Steelhead trout	20	1.67	57.70	19.55	20.09	1.21	1,211
COMMERCIAL PACKS.							
Sockeye salmon	41	2.37	64.78	20.80	11.22	1.23	860
Chinook salmon	24	2.21	63.17	17.67	15.72	1.21	991
Pink salmon	9	2.53	69.80	21.40	6.99	.76	696
Chum salmon	83	2.23	70.04	20.67	6.69	1.02	524
Average for all species	107	2.33	66.95	20.13	10.52	1.05	768
Steelhead trout	14	2.40	66.84	21.32	8.95	1.21	792
Atlantic salmon	6	1.14	64.30	21.14	12.49	1.22	920

The paper includes a general description of the different species of salmon, a map showing the localities from which the samples were obtained, and a bibliography of 13 titles.

The effect of storage on the peroxidase activity of whole milk powders, C. D. Dahle and L. S. Palmer (*Jour. Dairy Sci., 7 (1924), No. 2, pp. 141–146*).—The samples used in the previous study of the factors affecting the keeping qualities of whole milk powder (E. S. R., 51, p. 202) were examined for peroxidase by the Storch test at the end of the storage period. In all cases, factors known to favor oxidation, such as air, heat, and moisture, tended to destroy the peroxidase activity of the powders studied. The samples stored under vacuum and in containers which prevented the entrance of air and moisture showed greater peroxidase activity than samples of the same powders stored in containers permitting the entrance of air and moisture.

Some characteristics of invertase action, J. M. Nelson and G. Bloomfield (*Jour. Amer. Chem. Soc., 46 (1924), No. 4, pp. 1025–1043, figs. 7*).—The results are reported of a study of the relation between sucrose concentration and the rate of hydrolysis by invertase at various temperatures and H-ion concentrations and of the influence of temperature and H-ion concentration on the catalytic effect of invertase.

The experimental data show that the sucrose concentration at which the reaction attains a maximum velocity is independent of the temperature and the H-ion concentration, and that the effect of the latter upon the rate of the reaction is independent of the sucrose concentration. The H-ion concentration at which invertase first shows inactivation was found to decrease regularly between the temperatures of 25, 30, and 35° C.

"It was found that the temperature coefficient of the hydrolysis of sucrose in the presence of invertase was a function of the H-ion concentration and increased with decreasing acidity, and that hence the hydrolysis was inherently different from that by acid where the temperature coefficient is independent of the H-ion concentration.

"The hydrolysis of cane sugar in the presence of invertase involves at least two distinct stages. One of these, which is characterized by the sucrose concentration at which the hydrolysis attains a maximum velocity, is independent of the temperature and H-ion concentration, while the other changes with each of these."

The soil organic matter and growth-promoting accessory substances, N. A. CLARK (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 249, 250*).—The literature on the auximones is reviewed, and a brief report is given of experiments undertaken to test the possibility of the growth of plants in synthetic media furnishing no specific vitamins or auximones. The same plant, *Lemna major*, was used as in the original work of Bottomley (E. S. R., 45, p. 220), and an effort was made to find a suitable nutritive solution for its growth. As the basis, the salts suggested by Livingston (E. S. R., 44, p. 130)—monocalcium phosphate, potassium nitrate, and magnesium sulphate with iron supplied as ferric phosphate—were used.

"The plant was found to be sensitive to light and to the reaction of the medium, but concentrations of the three salts were found in which the plant would reproduce at a regular rate and in which there was no loss of health or decrease in size. For nearly five months, representing about 30 generations, the rate of growth has kept approximately constant, and the Lemna are as large and as healthy as the controls grown in water containing soil, although the rate of reproduction of the plants in the mineral solutions is rather slower than in the soil mixtures.

"As these green plants will maintain their health and reproduce without the aid of organic matter, the auximones can not be regarded as essentials for the growth of green plants in the same way as vitamins are essentials for the growth of animals. It is probable, therefore, that their function is of the same nature as the function of bios in the reproduction of yeast, and this point is being further investigated in this laboratory."

Concentration of vitamin B, P. A. LEVENE and B. J. C. VAN DER HOEVEN (*Science, 59 (1924), No. 1525, p. 276*).—This is a brief note to the effect that the authors have succeeded in preparing directly from dried yeast or from the Osborne and Wakeman fraction (E. S. R., 42, p. 314) a material which is from five to ten times more active as a source of vitamin B than the original fraction. The method consists in precipitation with a solution of barium hydroxid. The barium precipitate contains from 30 to 50 per cent of the total vitamin present in the solution.

Some observations on the properties and preparation of insulin, with special reference to the picrate-acetone method of preparation, E. C. DODDS and F. DICKENS (*Brit. Jour. Expt. Path., 5 (1924), No. 2, pp. 115–122*).—As the result of a study of the properties of insulin prepared by the Dudley method (E. S. R., 49, p. 803), the authors have developed a modification of their previously described method of preparation (E. S. R., 51, p. 410). This consists in treating the ground pancreas directly with finely powdered picric acid in the proportion of 45 gm. to 1 kg. of pancreas, the process being facilitated by passing the material through the grinder. The insulin picrate is then subjected to three successive extractions with acetone. In the first absolute acetone is used in sufficient quantity to make the final concentration 70 per cent, and in the succeeding extractions aqueous 70 per cent acetone is used in amounts equal to half the weight of the pancreas. The combined extracts are filtered, the filtrate is distilled to remove the acetone, and from the aqueous residue insulin picrate is precipitated, using if necessary additional saturated picric acid. After washing the picrate with ether, it is converted into the hydrochlorid, as in the previous method.

It is stated that the time required for the complete process is about one day, and that the precipitates are very easily handled. The rabbit unit of the crude hydrochlorid lies between 0.25 and 1 mg.

Potash from kelp.—VIII, Certain equilibria used in the manufacture of potassium chloride from kelp brines, J. W. Turrentine and H. G. Tanner (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 242–248, figs. 7*).—This paper deals with the theory upon which is based the method of manufacturing potash salts from kelp brines described in the previous paper (E. S. R., 48, p. 713).

A basic arsenate of calcium, H V. Tartar, L. Wood, and E. Hiner (*Jour. Amer. Chem. Soc., 46 (1924), No. 4, pp. 809–814*).—A basic calcium arsenate corresponding to the formula $3\ Ca_3(AsO_4)_2Ca(OH)_2$ has been prepared by the hydrolysis of tricalcium arsenate, the latter being prepared by a method similar to that described by Robinson (E. S. R., 39, p. 310). A similar product was prepared from calcium ammonium arsenate.

The method used in the hydrolysis of both consisted in heating under a reflux condenser a mixture of 8 gm. of the washed material with 1.75 liters of freshly distilled water. The liquid was siphoned off each day and replaced with fresh distilled water until the amount of arsenate ions in the liquid removed became constant. The product obtained, which was white, amorphous, and almost gelatinous, did not change in composition upon standing in contact with calcium hydroxid solution. The solubility of the compound in water at 25° C. was 0.0048 gm. in 100 gm. of water.

"The results here reported indicate that the basic arsenate would be superior to the tricalcium arsenate for use as an insecticide. The former is less soluble, is not hydrolyzed, and consequently is less liable to cause injury to foliage. The physical properties of the basic compound are not widely different from those of tricalcium arsenate, and from this point of view should be as well adapted for use."

Suitability of various solvents for extracting vanilla beans, II, J. B. Wilson and J. W. Sale (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 301–303*).—Analyses are reported of vanilla and tonka bean extracts prepared with the various solvents employed in the first part of the investigation (E. S. R., 50, p. 501).

The data presented confirm the previous conclusions that the extractive matter obtained with ether, acetone, and carbon tetrachlorid contains less of the true flavoring constituents than that obtained with the other solvents. The extracts made with 65 per cent ethyl alcohol had a higher content of vanillin, higher acidity, and higher lead numbers by both the Official and Wichmann methods than similar extracts made with 95 per cent ethyl alcohol, isopropyl alcohol, ether, acetone, or carbon tetrachlorid. The addition of potassium carbonate to the 65 per cent ethyl alcohol lowered the vanillin content and acidity and increased the lead numbers.

Analytical microscopy: Its aims and methods, T. E. WALLIS (*London: Edward Arnold & Co., 1923, pp. VIII+149, figs. 163*).—This handbook deals chiefly with methods of preparing materials for microscopic examination.

The determination of hydrogen-ion concentration by a spectrophotometric method and the absorption spectra of certain indicators, W. R. BRODE (*Jour. Amer. Chem. Soc., 46 (1924), No. 3, pp. 581–596, figs. 10*).—The method described depends upon the observation in the spectrophotometric study of certain dyes at various H-ion concentrations that with changes in the H-ion concentration of the dye solution the absorption band does not change in wave length but does in height. Similarly, the absorption bands of indicator solutions were found to vary in intensity but not in wave length with change in H-ion concentration. The H-ion concentration of an unknown solution may thus be determined by keeping the concentration of the indicator constant and comparing the height of the absorption band with those obtained from solutions of known H-ion concentration. In the case of colored solutions, some of the original solution without the indicator must be used in the comparison cell.

The most suitable indicators to cover the range in H-ion concentration have been selected, and standard curves obtained with these indicators for comparison with the curves obtained with the unknown. The indicator proving most satisfactory was thymol blue. With a mixed indicator of methyl red and bromothymol blue to use for the intermediate range not covered by thymol blue, a range of from pH 1 to 10 may be covered.

Details are given of the apparatus, buffer solution, absorption bands, etc.

The spectrophotometric determination of hydrogen-ion concentrations and of the apparent dissociation constants of indicators.—I, The methods, W. C. HOLMES (*Jour. Amer. Chem. Soc., 46 (1924), No. 3, pp. 627–631, figs. 2*).—"Simple, convenient, and relatively accurate methods are outlined for the determination of the H-ion concentrations of solutions by spectrophotometric means. They are based upon empirical calibration of spectrophotometric ratios with suitable indicators against known hydrogen electrode values. The data of such calibrations afford an advantageous means for the calculation of the approximate apparent dissociation curves of indicators and their approximate apparent dissociation constants."

The estimation of nitrates by electrometric titration, J. B. ROBERTSON and A. J. PELLING (*Jour. So. African Chem. Inst., 7 (1924), No. 1, pp. 9–13, figs. 3*).—The method suggested consists in allowing a known volume of the nitrate solution to oxidize a measured excess of ferrous ammonium sulphate solution, with subsequent back titration of the excess ferrous iron electrometrically with dichromate.

A new color reaction of nitric and nitrous acids [trans. title], L. DESVERGNES (*Ann. Chim. Analyt., 2. ser., 6 (1924), No. 4, pp. 102, 103*).—The reagent employed in the color test described is diethyldiphenyl urea. If to a solution of nitric acid a crystal of this compound is added and concentrated sulphuric acid is poured carefully down the side of the tube, a currant red ring is said to form between the two layers. The reaction is said to be sensitive to the extent of 1 part of nitric acid in 250,000.

New method for the volumetric determination of ammonium salts [trans. title], V. AUGER (*Compt. Rend. Acad. Sci.* [*Paris*], *178 (1924), No. 13, pp. 1081, 1082*).—The method consists essentially in the titration of a solution of the salt with Nessler's reagent, prepared by adding to 5 gm. of potassium iodid a saturated aqueous solution of mercuric chlorid until the precipitate of mercuric iodid no longer disappears, diluting the whole to 100 cc., and adding a few drops of a saturated solution of potassium iodid until the precipitate dissolves. With very small amounts of the reagent the color appears before the complete saturation of the anion, but with 15 cc. of the reagent the results were found to be the same within quite a range of volume of the solution being titrated. The end point is the point at which the yellow color which appears after each addition of alkali changes to a persistent brownish turbidity.

Volumetric determination of carbon [trans. title], J.-F. DURAND (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 14, pp. 1193–1195*).—The method described consists essentially in the oxidation by permanganic anhydrid in sulphuric acid solution of the substance to be tested, dissolved in sulphuric acid or carbon tetrachlorid, and the measurement of the carbon dioxid evolved. The technique of the method is described, and data are given on its application in the determination of carbon in a number of organic compounds. Certain substances do not give off carbon dioxid corresponding to all of the carbon present, but the method is said to be applicable to a large number of substances, particularly hydrocarbons and compounds containing carbon, hydrogen, and oxygen.

Some applications of the colorimetric phosphate method, A. P. BRIGGS (*Jour. Biol. Chem., 59 (1924), No. 2, pp. 255–264*).—The method previously described (E. S. R., 48, p. 111) has been modified slightly, with a resulting increase in the intensity of the color produced. The modification consists chiefly in reversing the order of adding the sulphite and hydroquinone and in using 1 cc. instead of 2 cc. of the acid molybdate solution. Various applications of the method are described, with analytical data. These include the determination of inorganic plus hydrolyzable organic phosphorus, total acid-soluble phosphorus, calcium and magnesium as phosphates, and total base.

The presence of silicon in the tissues.—A micromethod for the determination of silicon [trans. title], L. ISAACS (*Bul. Soc. Chim. Biol., 6 (1924), No. 2, pp. 157–168*).—The method employed in the reported determinations of silicon in human tissues and organs and in those of the dog and rabbit depends upon the reaction between silicates and ammonium molybdate in acid solution to form ammonium silico molybdate, which on reduction with sodium sulphite gives a blue solution which can be compared with appropriate standards in the colorimeter. The formation of the corresponding phosphomolybdate is prevented by the presence of acetic acid. The tissues examined were used in amounts of 0.5 gm. of the dried tissue, which is first oxidized with boric acid, calcium nitrate, and nitric acid.

While the determinations reported are too few to permit drawing definite conclusions, a small but appreciable amount of silicon was found in all of the various tissues and organs tested. The largest amount found was in the brain, which contains about 0.02 per cent of silicon dioxid. Rabbits contained more silicon than dogs.

Estimation of starch and sugars by the use of picric acid, M. R. COE and G. L. BIDWELL (*Jour. Assoc. Off. Agr. Chem., 7 (1924), No. 3, pp. 297–304*).—In this application of the picric acid colorimetric method to the determination of starch and sugars in feeding stuffs, malt extract was found to give more uniform results than takadiastase, as recommended by Myers and Croll (E. S. R., 45, p. 717). Sodium carbonate was found preferable to sodium hydroxid as the alkali. The special advantages claimed for the method are the possibility of using small samples or materials containing small amounts of starch or sugar, a considerable reduction in time over that required for the copper reduction method, and a simplification of manipulation.

Detection of rye flour in wheat flour [trans. title], J. König and F. Bartschat (*Ztschr. Untersuch. Nahr. u. Genussmtl., 46 (1923), No. 6, pp. 321–339, figs. 4*).—Various methods proposed for the detection of adulteration of wheat flour with rye are discussed and criticized. The method proposed depends upon the fact that, independent of the total protein content, about 25 per cent of the proteins of wheat and 50 per cent of those of rye are soluble in lime water. From the amount of protein dissolved in saturated lime water calculated as percentage of the total proteins of the mixed flour, the percentage mixture of the two flours can be determined by the use of a table which has been calculated from known proportions. The proteins of wheat and rye behave similarly in a 10 per cent solution of methyl and ethyl alcohol and acetone.

The viscosity of natural and remade milk, O. L. Evenson and L. W. Ferris (*Jour. Dairy Sci., 7 (1924), No. 2, pp. 174–188, fig. 1*).—This is a more complete report of an investigation which has been noted previously from another source (E. S. R., 49, p. 277).

Reading the fat in cream tests, G. Spitzer and W. F. Epple (*Jour. Dairy Sci., 7 (1924), No. 2, pp. 131–137*).—This contribution from the Indiana Experiment Station includes, in addition to data previously reported (E. S. R., 24, p. 77), a further comparison of the results obtained by the Roese-Gottlieb method and by the Babcock test, using glymol to eliminate the meniscus. The average difference in the percentage of fat, as determined in 12 samples by the Roese-Gottlieb and Babcock test with the use of glymol, was +0.002 per cent.

Production of acidophilus milk on a large scale for general use, C. C. Bass (*Jour. Amer. Med. Assoc., 82 (1924), No. 19, pp. 1503, 1504*).—A method suitable for the dairy manufacture of acidophilus milk on a large scale is described. The method differs from the usual laboratory method in that the milk is sterilized by interval heating at temperatures considerably lower than those of the autoclave. The successive steps of the process are as follows:

A tank of skim milk is heated to from 190 to 195° F., held at this temperature for 1 hour, cooled to 98°, held at this temperature for from 3 to 4 hours, heated again to from 190 to 195°, held at this temperature for 1 hour, and cooled to 98°. It is then inoculated with a pure culture of *Bacillus acidophilus* in milk in the proportion of 1 qt. to 100 gal. of milk, held at about 98° until the milk is coagulated and the desired acidity has developed, agitated mechanically to break up the coagulum, cooled, bottled, and distributed or stored in the refrigerator room. Suggestions are given for carrying out some of the steps of the process as outlined.

Clarification of cane juice, H. C. P. Geerligs (*Internatl. Sugar Jour., 26 (1924), No. 303, pp. 151–154*).—In this discussion of the theories involved in the methods in use for the clarification of cane juice, the author considers the chief object sought to be the flocculation of colloids, and outlines the various methods generally used for this purpose. Of these, the most promising is considered to be the change in the reaction of the solution. It is shown that this, combined with high temperature, constitutes the method of defecation by adding milk of lime to boiling cane juice. The determination of the H-ion concentration of the juice as a means of obtaining the end point is considered to make the method more reliable and rapid. Another method of promoting the flocculation of the colloids now used in the clarification of cane juice is the adsorption by surface attraction, using porous or flocculent materials such as filter cel and vegetable carbons. The sulphitation and carbonation methods are considered to be based upon the same principle. The final method discussed is the separation by centrifuging and ultrafiltration, as in the use of Plauson's ultrafilter.

Clarification of sugar products prior to the determination of reducing sugar, L. EYNON and J. H. LANE (*Jour. Soc. Chem. Indus., 42 (1923), No. 49, pp. 463T–466T*).—Data are presented indicating that in the clarification of solutions of raw sugar products with normal lead acetate no reducing sugar is carried down either in the clarification process or in the subsequent deleading process. Data are also reported on the invert sugar content of various raw sugars and molasses, using the untreated solution, the solution after decalcification with potassium oxalate, and the solution after clarification with normal lead acetate and removal of the lead and calcium with potassium oxalate. In all cases the standard method, with methylene blue as indicator (E. S. R., 49, p. 715), was used for determining the invert sugar.

With raw sugars, the treatment with normal lead acetate and potassium oxalate had very little effect on the value for reducing sugar, but with molasses such treatment led to a difference in results amounting to from 0.2 to 0.3 per cent.

The history and use of molasses, W. E. FITCH (*Amer. Food Jour., 19 (1924), No. 5, pp. 205–207, 233, 234*).—A popular discussion.

Commercial invert sugar: Its manufacture and uses, S. JORDAN (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 307–310*).—This is a general discussion of historical data on invert sugar preparation, patent literature on various commercial processes, methods used in its manufacture by hydrolysis with invertase and with acids, and the principal uses of the product.

Refining cottonseed oil, H. S. BAILEY (*Amer. Food Jour., 19 (1924), No. 5, pp. 203–205*).—A description of the various processes involved in the manufacture and refining of edible cottonseed oil.

The rubber industry, F. JACOBS (*L'Industrie du Caoutchouc. Paris and Liege: Libr. Polytech. Ch. Béranger, 1923, pp. V+473, figs. 209*).—This volume, while concerned chiefly with the manufacture of various rubber products, particularly automobile tires, contains introductory chapters on the production of natural, synthetic, regenerated, and artificial rubber, the chemicals employed in the rubber industry, and the analysis and vulcanization of rubber.

Chemistry and comfort.—Relation between the chemical composition of leather and the comfort of shoes made therefrom, J. A. WILSON and A. F. GALLUN, JR., (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 268, 269, figs. 2*).—Attention is called to the discomfort experienced in the wearing of shoes made of chrome leather as compared with vegetable-tanned leather. Experimental data are reported showing that this is due in part at least to the greater absorption of water with increasing humidity of the atmosphere by the chrome leather. This tends to increase the volume and area of the shoes, with corresponding shrinkage on drying. In the experimental work reported, strips of leather of the same grade tanned by both processes were suspended in desiccators furnishing varying amounts of moisture, and determinations were made from time to time of the water content and area of the samples. With increasing humidity from 0 to 100, the chrome leather increased in moisture content from 3.5 to 53.2 per cent, while the vegetable leather increased from 3.5 to 35.4 per cent. Corresponding increases in area were 18 and 6 per cent, respectively.

METEOROLOGY.

Monthly Weather Review (*U. S. Mo. Weather Rev., 52 (1924), Nos. 3, pp. 133–194, pls. 18, figs. 18; 4, pp. 195–248, pls. 14, figs. 23*).—In addition to detailed summaries of meteorological, climatological, and seismological data and weather conditions for March and April, 1924, and bibliographical information, reprints, reviews, abstracts, and minor notes, these numbers contain the following contributions:

No. 3.—Investigation of the Dust Content of the Atmosphere (illus.), by H. H. Kimball and I. F. Hand; Note on Organic Bodies Found in the Air of Washington and London (illus.), by N. Shaw; The Dust Fall of March 29, 1924: A Preliminary Note, by E. R. Miller; The Lava Tide, Seasonal Tilt, and the Volcanic Cycle (illus.), by T. A. Jaggar et al.; The Borings at Kilauea Volcano, by T. A. Jaggar; On the Prediction of Tidal Waves, by R. H. Finch; C. E. P. Brooks on Variations in the Level of the Central African Lakes, Victoria and Albert (illus.), by A. J. Henry; The Frequency of Winds of Different Speeds at Flying Levels Between New York and Chicago; A Further Analysis of the Records of the Air Mail Service (illus.), by W. R. Gregg and J. P. Van Zandt; Results of Measurements of Solar Radiation and Atmospheric Turbidity over the Atlantic Ocean and in Argentina.—Preliminary Report (illus.), by F. Linke, trans. by W. W. Reed; The Physical-Meteorological Observatory at Davos, Switzerland, by C. Dorno; A Meteorologist at Sea, by A. J. Henry; Some Notes on the Weather, March 21–23, 1924, Bermuda to New York, by C. F. Brooks; The Movement of the Cyclone of March 8, 1924, Across Texas (illus.), by A. J. Henry; The Sleet, Glaze, Snow, and Windstorm in Wisconsin, February 3–6, 1924, by W. P. Stewart; Tornado in North Texas on April 3, 1924, by J. L. Cline; and Note on Partial Correlation, by E. W. Woolard.

No. 4.—Hailstorms in Michigan, 1920–1923 (illus.), by D. A. Seeley and R. B. Dole (see p. 616); Heavy Hailstorm and Local Squall at New Orleans, La., with a Summary of the Previous Records of Hail, by R. A. Dyke; Severe Hailstorm at Corpus Christi, Tex.; Hailstones Observed at Budapest July 13, 1922 (illus.), by A. Réthly; Tornadoes from Arkansas to Virginia, April 29–30, 1924, by H. C. Hunter; Variations in Hourly Rainfall at Lincoln, Nebr. (illus.), by H. G. Carter; Hourly Precipitation at Topeka, Kans. (illus.), by S. D. Flora; Thunderstorm at Memphis, Tenn., April 29, 1924 (illus.), by A. R. Long; Frost on the Cranberry Bogs of New Jersey, by G. S. Bliss (see p. 617); Weather During April 21–26, 1924, and the Free-balloon Flights of April 23–25 (illus.), by V. E. Jakl; New Standards of Anemometry, by S. P. Ferguson and R. N. Covert; Why Hardwoods Do Not Grow Naturally in the West, by J. A. Larsen; Temperature Summations with Reference to Plant Life (illus.), by G. A. Pearson (see p. 616); Our Present Knowledge Concerning the Atmospheric Disturbances of Radiotelegraphy, by L. W. Austin; and Severe Winters in Southern Germany and Switzerland Since the Year 1400 Determined from Severe Lake Freezes, by J. Maurer, trans. by W. W. Reed.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 11 (1924), Nos. 3, pp. [200], pls. 4, fig. 1; 4, pp. [192], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for March and April, 1924.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and H. H. Shepard (*Massachusetts Sta. Met. Buls. 425–426 (1924), pp. 4 each.*)—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1924, are presented. The data are briefly discussed in general notes on the weather of each month.

Weather conditions and influences, M. J. Thompson (*Minnesota Sta., Duluth Substa. Rpt. 1922–1923, pp. 5–7*).—Observations on temperature, pressure, and crop conditions at the Northeast Experiment Station, Duluth, Minn., during 1922 and 1923, are briefly summarized.

Both years were characterized by severe winters, late springs, cool dry summers, and fine open falls. The growing seasons showed deficiencies of rainfall of 6.41 and 6.57 in., respectively, as compared with the normal of 28.61 in., the distribution being better in 1922 than in 1923. The rainfall was abundant and well distributed in May and early June, 1922, and a good hay crop resulted. In 1923 April, May, and early June were dry and only a partial crop was obtained. "The 1922 potato crop was poor; the 1923 crop excellent. The 1923 crop had the advantage of drier planting conditions, but June temperature and rainfall were favorable both seasons. The potato crop requires moisture at setting time, followed by cool weather. July, 1922, was normally warm but dry, followed by a hot dry August. Retarded growth, early maturity, a spread of such diseases as mosaic, and a short crop resulted. July, 1923, was normally warm and moist, followed by a dry but cool August; the July surplus of rain sufficed. A normal growth and maturity, scarcity of disease, and heavy yields resulted. The grain crops behaved in like manner. Oats and barley thrive in a cool dry season, with a dry seed bed. The spring of 1922 was wet, followed by a hot July and August, with resulting short yields. But the spring of 1923 was dry, with an ideal seed bed, and normal to cool weather in midsummer. Heavy yields followed."

Report of weather observations, C. H. Steelman (*New Jersey Stas. Rpt. 1922, pp. 85–88*).—Observations on temperature and precipitation during the year ended June 30, 1922, at the college farm at New Brunswick, N. J., are recorded and briefly summarized. The mean temperature for the year was 53.3° F., which is 1.6° above normal. The total rainfall was 45.57 in., which is 1.87 in. below normal. September to February, inclusive, was excessively dry. The month of June was excessively wet, furnishing favorable conditions for the development of fungus diseases. Killing frosts occurred April 22 and 23, which is abnormally late.

Temperature summations with reference to plant life, G. A. Pearson (*U. S. Mo. Weather Rev., 52 (1924), No. 4, pp. 218–220, figs. 2*).—Studies are reported which lead the author "to regard the mean maximum as a far better index of temperature than the mean, when plant life is under consideration," and "to recommend to ecologists that they consider the mean maximum temperature where thermograph records are not to be had."

Cloud forms, B. C. Kadel et al. (*U. S. Dept. Agr., Weather Bur., 1924, pp. 22, figs. 34*).—This publication defines and illustrates cloud forms according to the international system of classification, and gives height-frequency diagrams.

Hailstorms in Michigan, 1920–1923, D. A. Seeley and R. B. Dole (*U. S. Mo. Weather Rev., 52 (1924), No. 4, pp. 195–205, figs. 8*).—A study of the records of hail insurance companies and reports of cooperative observers of the Weather Bureau shows that "out of 601 storms reported in the four years, the total damage was estimated at $2,610,678, or $652,670 per year." The greatest number of storms occurred and the greatest damage, $1,011,845, was done in 1921. The largest number of storms and the greatest amount of damage are recorded in July. A study of the distribution of the hailstorms "proves conclusively that the Lakes are effective agents in preventing the vertical circulation which produces hailstorms and tornadoes. It is interesting that the region of greatest frequency of tornadoes in Michigan is practically coincident with the area of greatest frequency of hailstorms. The paths of some hailstorms could be traced across two or three counties, but the width is usually not greater than one township. In some cases two or three storms, with parallel paths, evidently occurred about the same time."

Frost on the cranberry bogs of New Jersey, G. S. Bliss (*U. S. Mo. Weather Rev., 52* (*1924*), *No. 4, pp. 212–214*).—The following radiation formula is applied to temperature humidity observations at Whitesbog, N. J.:

$$T=D-\frac{H-25}{4}+V-V'$$

"in which T is the prospective bog minimum temperature, D the p. m. dewpoint, H the p. m. relative humidity, V a variable depending upon the dewpoint, and V′ a variable depending upon the humidity." Applying this formula to the data for 76 radiation nights, it was found that in approximately 80 per cent of the cases the difference between the observed and the computed minimum temperatures did not exceed 3°. "Therefore the formula may be considered as about 80 per cent correct.

"It is believed that this formula and the values as tabulated will apply with equal accuracy to all of the bogs in New Jersey with the possible exception of those nearest to the coast. For bogs in other latitudes, such as Cape Cod, or in Wisconsin, it would no doubt be necessary to compute a different set, or sets, of values to use the minimum temperature equation."

SOILS—FERTILIZERS.

Alkali soil investigations.—I, A consideration of some colloidal phenomena, J. S. Joffe and H. C. McLean (*Soil Sci., 17* (*1924*), *No. 5, pp. 395–409, figs. 2*).—Studies conducted at the New Jersey Experiment Stations on the colloidal nature of some of the phenomena involved in the formation of alkali soils are reported.

The results showed that positive and negative adsorption in the system soil and soil solution are of great importance in leaching out soluble substances. Negative adsorption is desirable in alkali soils.

Coagulation of colloids was found to increase the surface tension of the extract and to modify the physical condition of alkali soils. These changes were manifested in the capillary rise of water and in the permeability of the soils to water.

An investigation of the effect of alum and sulphuric acid or both on the coagulation of alkali soil colloids showed that the effect of these two substances in combination is greater than that of either used separately. At a pH of 4.7, coagulation was practically instantaneous, indicating the possibility of this being the isoelectric point.

The colloids of alkali soils were found to be negatively charged, and are therefore precipitated with positively charged colloids or electrolytes with cations of high valency.

The dispersed phase affecting the surface influenced evaporation, and the vapor pressure of alkali soil extracts was changed but little by various treatments.

The active acidity of soils, E. T. Wherry (*Jour. Wash. Acad. Sci., 14* (*1924*), *No. 10, pp. 207–211*).—Data on the significance of active acidity in soils as opposed to total acidity are presented, and methods for ascertaining the degree of acidity attained by a given soil are reviewed. Some of these methods are shown not to yield active acidity values at all. Both electrometric and color-comparative methods of determining active acidity have inherent defects, but when care is taken to avoid errors of manipulation the two methods give corresponding results. The latter method is the more simple.

Active acidity and alkalinity are considered to be both directly and indirectly important in connection with the growth of plants. They may be directly toxic in high concentrations and indirectly toxic through affecting the solubility of iron and aluminum. They also exert a marked influence on the activities of various soil organisms, both beneficial and injurious. It is the author's opinion that no soil survey can be regarded as complete without including determinations of the reaction in terms of active acidity or alkalinity.

Controlling surface erosion of farm lands, F. L. Duley (*Missouri Sta. Bul. 211 (1924), pp. 23, figs. 17*).—This report presents the practical features of studies conducted over a 6-year period on the measurement of run-off and losses from soil erosion previously reported in Research Bulletin 63 (E. S. R., 51, p. 210).

It has been found that deep plowing to 8 in. is only slightly more effective than shallow plowing to 4 in. in preventing run-off and erosion. A growing crop on the land, particularly a small grain or sod crop, furnished the most effective means of reducing erosion. The character of the rainfall largely determined the amount of soil lost. A heavy dashing rain removed more soil within a few hours than was lost during a whole year when the rainfall was well distributed. Grass or clover land absorbed much more water than cultivated land.

The use of cropping systems which include sod crops like clover or other hays is considered to be the most practical means of reducing the surface erosion on rolling lands that must be cultivated a part of the time. It is stated that badly eroded soils may be rejuvenated by the use of crop rotations adapted to poor land, provided the proper fertilizer, manure, and lime treatments are applied to the soil. Chemical analyses of the eroded material showed that in many cases as much of the mineral plant nutrient elements may be lost through erosion as would be removed from the soil by average crops.

Soil survey of the Big Valley, California, E. B. Watson and S. W. Cosby (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+1005–1032, pls. 3, fig. 1, map 1*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 156,800 acres comprising the northwestern part of Lassen County and the southwestern part of Modoc County in northeastern California. The valley consists of a broad basin, the central part of which is flat and poorly drained.

The most striking soil characteristic of the valley is said to be the large extent of deposits of unconsolidated tuffaceous and diatomaceous earth materials that have weathered into shallow soils. All the soils of the area have their origin in the lava of the region and, with very local exceptions, are noncalcareous. Including rough stony land, scabland, and muck, 18 soil types of 8 series are mapped, of which rough stony land and Bieber fine sandy loam cover 20.5 and 20 per cent of the area, respectively.

Alkali accummulations are said to be of relatively small extent, but occur in some of the recent alluvial soils. The alkali salts consist mainly of white alkali, but there is said to be a strong admixture of black alkali.

Soil survey of Rabun County, Georgia, D. D. Long (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+1193–1211, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, deals with the soils of an area of 287,440 acres lying wholly within the Appalachian Mountain province in the northeastern corner of Georgia. The topography is rough and mountainous, and the county is drained by an intricate system of swiftly moving streams.

The soils of the county are chiefly upland mountainous types which have been derived through the weathering of light colored acid and dark colored basic crystalline rocks and quartzite. Including rock outcrop, 12 soil types of 10 series are mapped, of which Porters loam covers 71.2 per cent of the area.

Analyses of soils of Richmond County, L. M. Carter, M. W. Lowry, W. O. Collins, and R. M. Soule (*Ga. Agr. Col. Bul. 293 (1924), pp. 47, figs. 4*).—Supplementing the physical survey of Richmond County, Ga., made in cooperation with the U. S. D. A. Bureau of Soils (E. S. R. 38, p. 718), chemical analyses of representative samples of the prevailing soil types of the county are presented and discussed.

These indicate that nitrogen and organic matter are the limiting fertility factors in these soils, and that phosphoric acid is next in importance. While the potash content is variable and relatively large, it is also relatively unavailable and becomes a limiting factor in crop production on the sandy soils for cotton and other crops requiring considerable potash.

Soil survey of Dallas County, Iowa, C. Lounsbury and P. E. Nordaker (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+1153–1192, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 376,960 acres lying slightly southwest of the center of Iowa. The surface is that of an even drift-covered plain, the southern part of which has received a mantle of silty material or loess. Along the larger streams the surface has become somewhat dissected and rolling, but back from these drainage ways the surface is flat to gently undulating. Drainage is said to be more thoroughly established in the southern part of the county and in the vicinity of the larger streams. A large portion of the western and east-central parts do not afford sufficient relief for ready drainage.

Most of the soils of the county are dark colored and all of them are of transported origin, having been deposited by glaciers, wind, and water. Including muck and peat, 29 soil types of 16 series are mapped, of which the Carrington loam and Webster clay loam cover 43.1 and 13.6 per cent of the area, respectively.

Soil survey of Norfolk, Bristol, and Barnstable Counties, Massachusetts, W. J. Latimer, E. T. Maxon, et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. IV+1033–1120, pls. 4, fig. 1, maps 3*).—This survey, made in cooperation with the Massachusetts Department of Agriculture, deals with the soils of Norfolk, Bristol, and Barnstable Counties in southeastern Massachusetts, which have respective areas of 252,800, 362,880, and 254,720 acres.

The general topography of Norfolk and Bristol Counties consists of moderately undulating to rolling areas, smooth ridges with broad sweeping to steep slopes, and hills, occurring without any orderly arrangement and interspersed with lower lying plains and depressions. The topography of Barnstable County consists of irregular to rough morainic ridges, smooth to broken sand plains, and a very irregular coast line. The three counties taken as a whole are naturally well drained. Marshy areas subject to tidal overflow occur along the coast of all three counties. In Norfolk and Bristol Counties poor drainage prevails in the very flat and depressed areas and on the gentle slopes affected by seepage.

The soils of the area are very largely of glacial origin, either from stony or gravelly deposits laid down by ice or sandy and gravelly deposits laid down by water. Where good drainage has prevailed the soils are brownish to grayish in the surface layer and yellowish brown in the subsoil, while in the poorly drained areas they are dark gray to black in the surface soil and mottled gray in the subsoil. Including coastal beach, dunesand, madeland, meadow, muck, reclaimed tidal marsh, rough stony land, and tidal marsh, 53 soil types of 11 series are mapped. The Hinckley gravelly sandy loam and muck cover 10.8 and 10 per cent, respectively, of Norfolk County, the Gloucester and Merrimac sandy loams cover 26.8 and 10.3 per cent, respectively, of Bristol County, and the Plymouth sandy loam and Hinckley coarse sand cover 16.8 and 16.3 per cent, respectively, of Barnstable County.

Soil survey of Johnson County, Nebraska, H. L. Bedell and H. E. Engstrom (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+1255–1285, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 239,360 acres lying within the glaciated part of the Great Plains province in southeastern Nebraska. The greater part of the county has a rolling surface and practically all of it has adequate drainage.

Ten soil types of 6 series are mapped, of which the Carrington silt loam and loam and the Pawnee and Wabash silt loams cover 29.7, 19.4, 16.7, and 12.2 per cent of the area, respectively. It is stated that the broadest and most striking characteristic of the soils of the area is their dark color, resulting from their high content of black organic matter. They are said to be comparatively uniform in chemical composition.

Microbiological analysis of soil as an index of soil fertility.—IX, Nitrogen fixation and mannite decomposition, S. A. Waksman and P. D. Karunakar (*Soil Sci., 17 (1924), No. 5, pp. 379–393, figs. 3*).—In a further contribution on the subject from the New Jersey Experiment Stations (E. S. R., 51, p. 416) studies of the nitrogen fixing or mannite decomposing power of soil as an indication of its available phosphorus content are reported.

It was found that the determination of the nitrogen fixing capacity of the soil as a result of the addition of mannite is not reliable, due to the small amounts of nitrogen fixed and to the insensitiveness of the method for determining the total nitrogen in the soil. A study of the disappearance of mannite in the soil by the method suggested by Christensen is considered to be much more applicable.

Three methods are therefore recommended for the determination of the nitrogen fixing and mannite decomposing power of a soil with a view to obtaining information on the microbiological flora capable of fixing nitrogen and on the available phosphorus in the soil. The first of these is the common solution method, which consists in adding from 1 to 5 gm. of soil to a standard mannite solution, incubating for from 7 to 28 days, and then determining the increase in total nitrogen above the control. The second method is that suggested by Niklewski and Stoklasa, which consists in adding 10 gm. of the particular soil to 100 cc. of 2 per cent mannite solution free from available phosphates, sterilizing, and inoculating with a vigorous culture of Azotobacter. After incubating for from 20 to 30 days the increase in total nitrogen is determined. The third method is that for determining residual mannite or soluble organic matter in the soil, suggested by Christensen. This consists in adding 2 per cent of mannite to the soil, incubating with optimum moisture, and then determining the residual mannite every 5 days by oxidation with potassium permanganate.

Influence of organic matter upon the development of fungi, Actinomycetes, and bacteria in the soil, S. A. Waksman and R. L. Starkey (*Soil Sci., 17 (1924), No. 5, pp. 373–378*).—Studies conducted at the New Jersey Experiment Stations on the course of decomposition in the soil of organic substances of varying carbon-nitrogen ratio are reported. The organic materials used included dextrose, cellulose, rye straw, alfalfa meal, and dried blood.

Three weeks after adding the materials all of them greatly increased the numbers of microorganisms in the soil but not all to the same extent. Some materials greatly affected one group of microorganisms but the others to a much less extent. Dextrose increased the numbers of bacteria, while cellulose increased the numbers of fungi. Rye straw and alfalfa meal increased the numbers of fungi and bacteria, while dried blood increased both of these and the Actinomycetes.

Additions of sodium nitrate to the soil treated with straw further increased the numbers of fungi without affecting the numbers of bacteria. Alfalfa increased the numbers of microorganisms to a greater extent than straw, while dried blood caused greater increases than both of these materials.

The numbers of fungi increased more abundantly in acid soils than in neutral soils, and the numbers of microorganisms reached a much higher point in the fertile than in the less fertile soils.

[Nitrate control studies at the Colorado Station], A. Kezer (*Colorado Sta. Rpt. 1923, pp. 13, 14*).—Studies of the chlorin content of soil samples analyzed for nitrates are said to have indicated no relation between nitrate and chlorin concentrations.

Fifteen years of field experiments with manure, fertilizers, and lime on Sassafras silt loam soil, G. L. Schuster (*Delaware Sta. Bul. 137 (1924), pp. 3–45, fig. 1*).—Data from 15 years of experiments upon the various methods of manuring and fertilizing with and without lime and their effect upon the yield and quality of crops on Sassafras silt loam soil are reported. The rotation consisted of corn followed by a cover crop of rye and vetch or crimson clover, oats or soy beans, wheat, and clover and timothy.

The results showed that where general farm crops are grown, such as corn, oats, soy beans, wheat, or mixed hay in a rotation including a legume to be harvested or plowed under, potash is the first factor that limits crop production, phosphoric acid is the second factor, and nitrate the third. Acid phosphate was found to rank first as a carrier of phosphoric acid, basic slag second, and rock phosphate last. Manure was found to be equally as good if not better than a complete fertilizer.

The value of lime was limited by other factors in the treatment, and it was useless on corn or soy beans except where potassium chlorid was also applied. It produced the greatest gains in the hay crop when applied with potassium chlorid and with a combination of potassium chlorid and sodium nitrate.

Applications of potassium chlorid produced the most marked effect upon the quality of wheat and corn. The addition of acid phosphate and sodium nitrate to potassium chlorid added further to the quality of wheat and corn. No results were obtained when sodium nitrate was used alone.

North Vernon Experiment Field—results of soil fertility investigations, 1913–1922, C. Juengst (*Indiana Sta. [Leaflet, 1923], pp. 4, fig 1*).—The results of soil fertility investigations, extending from 1913 to 1922, inclusive, on the soils of the North Vernon Experiment Field of the station are briefly presented.

Scottsburg Experiment Field—results of soil fertility investigations, 1906–1922, A. G. Mace (*Indiana Sta. [Leaflet, 1923], pp. 4, fig. 1*).—The results of soil fertility investigations, extending from 1906 to 1922, inclusive, on the soils of the Scottsburg Experiment Field of the station are presented.

[Soil fertility studies at the Duluth, Minn., Substation], M. J. Thompson (*Minnesota Sta., Duluth Substa. Rpt. 1922–1923, pp. 20–26, 27–29*).—Phosphate and manure experiments begun in 1916 (E. S. R., 48, p. 322) are briefly reported. These showed that on rotations including potatoes, rutabagas, hay, and oats manure alone is the most effective single agency, but a small increase is realized when manure is used in combination with phosphate. This small increase and that with phosphate used alone leads to the conclusion that the use of either rock or acid phosphates will not pay under the present condition of the soils.

Studies on the utilization of clover, extending over six years, showed that pasturing the crop, with a return to the field in the form of manure, proved to be slightly the better method in all cases. Plowing under the crop appeared to be a poor practice, since the feed was lost and there was no compensating gain.

Experiments begun in 1917 on a rotation without clover or manure showed that the soils used will improve from year to year under constructive management, especially with the use of clover and manure in the rotation.

Rate of manuring experiments begun in 1917 (E. S. R. 48, p. 325) showed in general an increased effect from manure. The application of 5 tons was the most effective for potatoes. Ten tons, whether put on grain or grass stubble, was found to be the most economical quantity for most crops.

Studies on garden fertilizers and fertility tests on burned virgin mineral soil are also briefly noted.

Soil chemistry and bacteriology [studies at the New Jersey Stations] (*New Jersey Stas. Rpt. 1922, pp. 27–29*).—A brief review is given of the work in soil chemistry and bacteriology during the past year, special attention being drawn to further plans.

Studies made of soil where ammonium sulphate had been used for the past 15 years showed in one case a rather high content of soluble aluminum in the water extract, while similar extracts from another plat of the same soil showed only traces of soluble aluminum. Plants grown in the first extract were very short and stubby with a poor root hair development and abnormal top growth, while those grown in the second extract showed normal root development. Vegetation tests in the first soil demonstrated the pronounced corrective effects of basic materials and acid phosphate.

Field and greenhouse studies of methods of applying fertilizers to potatoes showed that the lateral movement of fertilizers in much less than the vertical movement. This is considered to indicate the advisability of side applications where large amounts are used.

The continuous growing of corn with a legume and nonlegume green-manure crop—season 1921, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1922, pp. 349–354, pl. 1*).—Further studies are reported (E. S. R., 48, p. 324), which showed that in the continuous cultivation of corn a legume green manure has distinctly more value than a nonlegume. Small applications of farm manure were found to have a pronounced beneficial effect as compared with no manure, but this influence is not always directly proportional to the amount of manure used. This is taken to indicate that the beneficial effects are due to some other factor than the additional plant nutrients supplied by the manure. In general, the percentage of nitrogen was higher in grain and stover from the legume-treated plats than in that from the nonlegume-treated plats.

The continuous growing of wheat and rye with and without a green-manure crop—season 1921, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1922, pp. 347–349*).—Further studies are reported (E. S. R. 48, p. 324), which showed definitely that it is possible to grow wheat after wheat for a period of years without the use of commercial nitrogenous fertilizers, and that it is possible to grow a fair legume green-manure crop between wheat harvest and wheat seeding, and by this means increase the yield of grain by more than 50 per cent.

The plan of growing grain year after year on the same land and of depending entirely upon green manure as a source of nitrogen is not recommended. Crop rotation and supplementing the green manure with some commercial nitrogenous fertilizers or farm manure or both is considered to be a better practice.

Questions relating to the composition of agricultural soils and their fertilization [trans. title], C. Dusserre (*Landw. Jahrb. Schweiz, 37 (1923), No. 6, pp. 705–714, fig. 1*).—In this contribution the important points of contact between the agricultural colleges and experiment stations of Switzerland with reference to soils and soil fertility studies are outlined, the purpose being to effect a closer coordination of such activities in the two types of institution.

Fertilizer experiments in the years 1916 to 1922 [trans. title], W. Schneidewind and F. Münter (*Arb. Deut. Landw. Gesell., No. 324 (1923), pp. 36*).—The results of a large number of fertilizer experiments conducted in Germany during the years 1916–1922 are summarized, with special reference to the activity of different forms of nitrogen.

Sodium nitrate proved to be in general the best nitrogenous fertilizer except for potatoes, where ammonium sulphate was slightly its superior. Ammonium chlorid was apparently as effective in general as ammonium sulphate except for potatoes. The results with urea and urea nitrate did not come up to expectations, and in some cases marked nitrogen losses were attributed to the former. On the average the results given with these two fertilizers were no better than those given by lime nitrogen. Markedly unfavorable results were obtained with granulated lime nitrogen.

In the potash experiments kainit showed generally better returns with grain than the concentrated salts such as 40 per cent potash salt and potassium chlorid. On the other hand, results were better with the concentrated salts than with kainit on potatoes, and the best results were with potassium sulphate. In the phosphate experiments Thomas meal and precipitated phosphate appeared to be superior to superphosphate on light sand soils deficient in lime.

The fertilization of meadows and pastures, with special reference to moor and marsh meadows [trans. title], Engels (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 41 (1923), Nos. 9–10, pp. 106–108; 11–12, pp. 118–120; 13–14, pp. 128–131; 15–16, pp. 138–141, figs. 2; 17–18, pp. 146, 147, fig. 1*).—Studies on the fertilization of moors and marsh meadows are reported, showing that the practice on this type of land requires as much attention to each individual case as the fertilization of dry and irrigated meadows.

Green manuring in theory and practice [trans. title], O. Nolte (*Flugschr. Deut. Landw. Gesell., No. 23 (1923), pp. 43, pls. 4*).—This is a brief popular treatise on green-manuring practice, with special reference to the requirements of German soils.

Further experience with green manures and cover plants at the experiment station, Peradeniya, T. H. Holland (*Ceylon Dept. Agr. Yearbook, 1924, pp. 51, 52, pls. 2*).—Data on the growth and fertilizer value of different green manure plants are briefly presented.

Plant food balance (*Amer. Fert., 60 (1924), No. 12, pp. 34–39*).—The results of a questionnaire sent to different agricultural experiment stations in an effort to calculate the approximate balance of income and outgo of plant nutrients in soil for various States are summarized.

Calculating amounts and prices of fertilizers, E. A. Miller (*Tex. Agr. Col. Ext. [Circ.] C–34 (1924), pp. 4*).—Data applicable to Texas conditions are presented.

Influence of nitrogen fertilization upon the microbiological activities of the soil, S. A. Waksman (*New Jersey Stas. Rpt. 1922, pp. 359–361*).—Studies are briefly reported showing that there is some correlation between the total number of soil microorganisms and crop yields. The numbers of fungi were found to be highest in acid soils and in soils rich in organic matter. The application of lime depressed the numbers of fungi in the soil. There was no correlation between ammonia formation in the soil and in solution and crop yields. There was some correlation between nitrification in the soil and crop yields, but this correlation was far from being parallel to crop production.

Effect of repeated applications of ammonium sulphate on the reaction and crop-producing power of a soil, L. H. Jones (*New Jersey Stas. Rpt. 1922, pp. 384–388, pl. 1*).—Studies are briefly reported which showed that when the pH values of the soil go below 5, the soil approaches a sterile condition for the growth of soy beans, and that this condition may be corrected with lime applied in sufficient quantities to bring the pH values up to around 7.

A preliminary note on the effect of the nitrate radical upon the biological oxidation of inorganic sulfur, R. V. Allison (*New Jersey Stas. Rpt. 1922, pp. 366–369*).—Studies with four soils to determine the cause of the depressive influence of sodium nitrate on sulphur oxidation indicated that the nitrate radical is the source of injury. In a soil containing sodium carbonate, however, no injury was apparent as a result of the application of nitrates.

Studies of the effect of increasing quantities of nitrates showed that while sulphur oxidation advanced but little in the case of check cultures, its advance was somewhat more appreciable under the conditions of the various treatments as a result of the dissipation of the nitrate, due probably to the very heavy microbial activity of the soil. The results showed further that there are present in the alkali soil salts which are antagonistic to the tendency of the nitrates to depress oxidation of sulphur in other soils, and also that the range of depression with increasing applications of nitrate salts is markedly more limited in clay than in loam soils.

Studies with calcium and sodium nitrates showed that while the nitrate in both forms was distinctly adverse to sulphur oxidation in the high concentrations of 0.1 and 0.2 N, it was not fundamentally toxic but rather desirable as a source of nitrogen when used at proper concentrations.

Effect of nitrate applications upon the hydrocyanic-acid content of sorghum, R. M. Pinckney (*Jour. Agr. Research [U. S.], 27 (1924), No. 10, pp. 717–723*).—Studies conducted at the Minnesota Experiment Station on the possibility of using sorghum as an indicator in studies of the availability of nitrogen are reported. The hydrocyanic acid content in sorghum plants grown in the greenhouse on three Minnesota soils deficient in nitrogen and treated with sodium nitrate in different amounts was determined.

The size of the plants, their color, and their prussic acid content were all found to be affected by the amount of nitrate applied. In general the percentage of hydrocyanic acid in the green plants was in proportion to the nitrate used. This effect continued even beyond the point where the nitrate ceased to affect the color and size of the plants. In the light-colored plants the percentage of acid was very low, and in some cases none could be determined, while in all darker-colored plants it was readily determined. The leaves of the latter plants contained several times as high a percentage as the stems, and the applications of nitrate showed no distinct effect upon its distribution between stem and leaf.

These results are taken to indicate that sorghum gives promise of being useful as an indicator plant in studies of the supply of readily available nitrogen in soils.

Experiments with new phosphoric acid fertilizers [trans. title], E. HASELHOFF (*Mitt. Deut. Landw. Gesell., 39 (1924), No. 3, pp. 40, 41*).—Comparative tests of superphosphate, Thomas meal, raw phosphate, tetraphosphate, and so-called colloidal phosphate on oats, beets, and potatoes are reported. The results have demonstrated the apparent value of the colloidal phosphate as compared with superphosphate and Thomas meal, and suggest the importance of further tests of this material.

Acid phosphate by the biological process, J. S. JOFFE (*New Jersey Stas. Rpt. 1922, pp. 361–365*).—This is a brief report of studies previously noted from other sources (E. S. R., 48, p. 822; 49, p. 624).

Should we have a potash industry? J. W. TURRENTINE (*Chem. and Metall. Engin., 31 (1924), No. 1, pp. 14, 15*).—In a contribution from the U. S. D. A. Bureau of Soils the potash industry in the United States is briefly outlined, special attention being drawn to the different sources of potash, including lake brines, blast-furnace dust, cement dust, kelp distillery wastes, alunite, leucite, greensand, shale, and wood ashes.

Potash fertilization of moor waters [trans. title], E. SCHEFFELT. (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 41 (1923), Nos. 5–6, pp. 30–33; 9–10, pp. 102–106*).—Studies on the fertilization of fishponds in moors are briefly reported, indicating that the addition of potash salts to such ponds increases the growth of algae and thereby permits an increase of animal life.

Laboratory tests on the effects of liming on water percolation thru adobe soil, A. FORBES (*Hawaii Univ. Quart. Bul., 3 (1924), No. 1, pp. 16, 17*).—Studies are reported the results of which showed that air-slaked lime increases the rate of percolation as soon as applied to adobe soils, the increase being far greater when amounts of lime equivalent to 25 tons per acre are applied than with only 15 tons or less. After limed soil was wetted and permitted to dry and flocculate the percolation of water through it was much greater than that previous to such flocculation.

Agricultural lime analyses (*Md. Univ. Quart., No. 98 (1922), pp. 13*).—Guaranties and actual chemical analyses of 80 samples and mechanical analyses of 21 samples of agricultural lime collected for inspection in Maryland for the year ended November, 1922, are presented and discussed.

Lime analyses (*Md. Univ. [Quart.], No. 103 (1923), pp. 14*).—Corresponding data for the year ended November, 1923, are presented, including chemical analyses of 49 and mechanical analyses of 12 samples of agricultural lime.

Lime report, 1922–1923, J. W. KELLOGG (*Penn. Dept. Agr. Bul. 380 (1924), pp. 35*).—Guaranties and actual analyses of 207 samples of limes and lime materials representing 64 brands collected for inspection in Pennsylvania during the years 1922 and 1923 are presented, together with a list of lime registrations for 1923.

The residual effect of borax on potatoes and corn, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stas. Rpt. 1922, pp. 357, 358*).—Further studies are briefly reported (E. S. R., 48, p. 325), which showed that a loam soil when properly handled will apparently prevent the action of much toxic material within the period of a year. Much, however, depends upon moisture conditions, since during a period of dry weather the salts become concentrated at the surface and injury is likely to follow. On the other hand, if there is much rain the soluble salts are carried downward and diffused throughout the mass of soil, and the danger of injury is greatly diminished.

Fertilizer analyses (*Md. Univ. Quart., Nos. 95 (1922), pp. 32; 97 (1922), pp. 40; 99 (1923), pp. 32*).—Guaranties and actual analyses of 333, 653, and 497 samples of fertilizers and fertilizer materials collected for inspection in Maryland from August, 1921, to January, 1922, inclusive; from February to

July, 1922; and from July, 1922, to January, 1923, are reported in these three numbers, together with a list of fertilizer registrations in the State for the respective periods. The text of the State fertilizer law is given in No. 97.

Fertilizer analyses (*Md. Univ.* [*Quart.*], *Nos. 102* (*1923*), *pp. 34, fig 1; 105* (*1924*), *pp. 32 fig. 1*).—Guaranties and actual analyses of 585 and 300 samples of fertilizers and fertilizer materials collected for inspection in Maryland from January 1 to July 1, 1923, and from July 1, 1923, to January 1, 1924, are presented and discussed in these two numbers. The text of the fertilizer law of Maryland is included in No. 105.

Fertilizer registrations, January 1 to June 1, 1923 (*Md. Univ.* [*Quart.*], *No. 101* (*1923*), *pp. 29*).—A list of fertilizer registrations in Maryland from January 1 to June 1, 1923, is presented.

Fertilizer registrations, June 15, 1923, to January 5, 1924 (*Md. Univ.* [*Quart.*], *No. 104* (*1924*), *pp. 24*).—A list of fertilizer registrations in Maryland from June 15, 1923, to January 5, 1924, is presented.

Analyses of fertilizers, fall season, 1923 (*N. C. Dept. Agr. Bul., 1924, Mar., Sup., pp. 9*).—Guaranties and actual analyses of 177 samples of fertilizers and fertilizer materials collected for inspection in North Carolina during the fall of 1923 are presented.

AGRICULTURAL BOTANY.

Daily variation of the carbohydrates in the leaves of corn and the sorghums, E. C. MILLER (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 10, pp. 785–808, figs. 6*).—Results are given of a comparative study of the carbohydrate formation in some varieties of corn and sorghums. It was found that the amount of dry matter in a given area of the leaf of the sorghums was always greater than in a like area of the leaf of corn. The dry matter in the leaves of both plants is said to begin to increase at daylight, reaching a maximum at periods varying from 2 to 6 p. m., and then gradually diminishing until daylight the following morning. In the comparative experiments with corn and milo, the maximum increase of dry matter per square meter of leaf during the day was approximately twice as great in the leaves of milo as in the leaves of corn.

The amount of water in a unit of leaf area was found always to be greater in the leaves of corn than in the leaves of sorghums.

The total sugars in the leaves of the plants under observation began to increase between 4 and 6 a. m., reaching a maximum between 12 m. and 5 p. m., after which they gradually decreased until daylight of the following morning. No evidence was found to indicate that there was any difference between corn and the sorghums in regard to the time of day at which the maximum amount of sugar and dry matter may occur in the leaves.

Insoluble carbohydrates reached a maximum later in the day than the sugars, and after they had reached the maximum showed little decrease until about midnight, after which they decreased rapidly until morning. The increase in the total sugars and insoluble carbohydrates in the leaves during the day only approximated from 46 to 92 per cent of the total increase in dry matter of the leaves for the same period.

The nonreducing sugars in the leaves of the plants, with the exception of Dwarf milo and Red Amber sorgo, were always in excess of the reducing sugars. The nonreducing sugars increased markedly during the day and decreased during the night, while the reducing sugars, as a rule, showed very little increase, and the amount present at different periods of the day was very irregular. No significant differences were observed between corn and the sorghums in regard to the relationship between the reducing and nonreducing sugars in their leaves.

A study of plant growth in relation to the weight of seed, D. SCHMIDT (*New Jersey Stas. Rpt. 1922, pp. 388–394, figs. 2*).—In continuation of similar studies previously reported (E. S. R., 48, p. 329), the author gives an account of studies with soy beans, buckwheat, and radishes.

With soy beans it was found that following the germination of the seed all the advantage in the early development of the plants was in favor of those grown from the heavier seeds, the plants maturing earlier than did those grown from the lighter seeds. With buckwheat the average dry weight, green weight, and leaf area measurements from seeds of heavier weight were always superior to those from plants grown from seeds of lighter weight. This advantage was evident in the early stages of development of the plants and was maintained throughout the entire period. With the radishes the average yields obtained from seeds of medium weight were higher throughout than those obtained from small seeds, while the average dry weight yields obtained from the heavier seeds were nearly double the corresponding yields from small seeds and much superior to those from seeds of medium weight for each harvest.

On the channels of transport from the storage organs of the seedlings of Lodoicea, Phoenix, and Vicia, H. H. DIXON and N. G. BALL (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1923), No. 20–24, pp. 185–196, pls. 5*).—Continuing work previously noted (E. S. R., 48, p. 430), the authors have investigated the structure of the organs connecting the stores with the embryo in seedlings of *L. sechellarum*, *P. dactylifera*, *P. canariensis*, *P. sylvestris*, and *V. faba*.

"The presence of the vascular network in haustoria and of conducting tracts in the transmitting organs suggests that the vascular bundles are the channels by which the embryo receives the organic supplies from its storage organs. The development of tracheal tubes in transmitting organs of seedlings, where the transport of water is unnecessary, is in conformity with the view that these tubes convey organic store material. Experiment shows that these tubes will convey fluid either in a basal or in a distal direction, according to the position of the source and sink. The lateness in the differentiation of the sieve tubes in the vascular strands of the petioles of the cotyledons of *V. faba* shows that much transport of organic substance down the petiole is effected without their assistance. During this period tracheae are available. Transport of organic substance through the parenchymatous cells of the haustoria and through those of storage cotyledons has to be attributed to the permeability of the protoplasm of these cells. It seems gratuitous to assume that the cells adjacent to the tracheae are the only cells in these organs which are impermeable. If they are permeable, the tension set up in the tracheae will secure movement of organic fluids into and along the tracheae. The great development of the phloem in the haustoria compared with its mass in the transmitting organ—the petiole—suggests that this tissue is chiefly concerned with the preparation of the organic substance absorbed and its transmission into the tracheae."

It is pointed out that sieve tubes in their mature state are by no means ideally constructed for the transmission of organic substances. The pores in their sieve plates are exceedingly fine, and they are mostly or entirely blocked by protoplasm or callus. It seems quite possible that the sieve tubes should be regarded rather as minute reservoirs than as conduits.

The bundle endings in leaves and in growing points, it is well known, are without well differentiated sieve tubes, and their phloem is composed of cambiform cells only. These may be supposed to be effective in transmitting the products of photosynthesis into the tracheae and at the growing points to extract these supplies for the growth there. The companion cells of the phloem are completely filled with finely granular and easily staining protoplasm. Their nuclei are comparatively large. Their appearance is that of secreting cells. Hence it may be provisionally assumed that they perform the function of secreting substances (probably enzyms) to prepare the organic materials and render them suitable for introduction into the tracheae and for transmission in these tubes. These secretions may be stored in the sieve tubes, whose sieve plates prevent their passage along the bundle. The sieve plates may be regarded as partitions which allow the protoplasm to be withdrawn through their pores, but which at the same time have been rendered practically impermeable by the remnant of protoplasm and the callus left blocking the pores.

The hydrogen ion concentration of the soil in relation to the flower colour of Hydrangea hortensis W., and the availability of iron, W. R. G. Atkins (*Roy. Dublin Soc. Sci. Proc., n. ser., 17 (1923), No. 20–24, pp. 201–210*).—When studying the relation between the distribution of plants and the H-ion concentration of the soil (E. S. R., 48, p. 514), it was noticed that pink hydrangeas were found on alkaline soil and blue on acid. A number of situations were examined to test the validity of this observation, and the results are given in tabular form.

Other facts and considerations indicated rendered it of interest to see whether it was possible by direct tests to demonstrate the presence of a greater amount of iron in blue hyrangea flowers than in pink.

"The common garden hydrangea, *H. hortensis*, produces blue flowers when grown in soil at pH 5.7 to 6 or slightly over. In less acid habitats some flowers may be pink and others blue on the same plant, but above about pH 7.5 pink flowers only are the rule. Ferrous salts remain in solution after ferric salts have been precipitated or rendered completely insoluble as the hydroxid. The precipitation of ferrous hydroxid does not begin until about pH 5.1, and even at pH 7.1 an appreciable amount remains unprecipitated. Since plants grow at pH values beyond the limits for the complete precipitation of ferric salts, they must, under these conditions, utilize ferrous salts only. The difference between the pink and blue flowers of hydrangea is not due to acidity, since both kinds from the same plant were found to be at precisely the same H-ion concentration, pH 4.2.

"The . . . haematoxylin test shows that blue hydrangea flowers give the typical purple and brown reactions for 'inorganic' iron, whereas pink flowers have only minute traces of 'inorganic' iron. Colorimetric estimations with ammonium thiocyanate show that the ash of the pink flowers contains only six-tenths as much iron as that of the blue. Calculating on the dry weight of the flowers themselves, the blue contain about 140 parts per million of iron and the pink about 60 parts per million. Dilute solutions of alum and of aluminum sulphate give a reaction of about pH 4, ranging up to about pH 3.6 for more concentrated ones. These substances, therefore, are convenient reagents for increasing soil acidity without risk of attaining injuriously high H-ion concentrations by accident. To the increase in acidity, and consequent liberation of iron, is due the blue color of hydrangea found by Molisch to result from this treatment. . . .

"The precipitation limits for ferrous and ferric salts throw light upon the availability of iron in the soil and on the occurrence of chlorosis in certain plants when grown on alkaline soils. The formation of iron pan may be considered from this viewpoint, and the lessened solubility of iron salts when converted into the ferric condition is of importance in explaining the formation of pan where an acid soil solution percolates into a less acid region which is still sufficiently near the surface for oxidation of the precipitated hydroxid to proceed; ferric salts, if present, would be precipitated slightly before the ferrous, as would also those of aluminum."

The penetration of dyes as influenced by hydrogen ion concentration, M. IRWIN (*Jour. Gen. Physiol., 5 (1923), No. 6, pp. 727–740, figs. 4*).—"The purpose of this investigation is to analyze the mechanism by which dyes are taken up by the cell under the influence of different concentrations of H-ion. . . .

"When cells of Nitella are placed in buffer solutions at pH 9, there is a very slow and gradual increase in the pH of the sap from pH 5.6 to 6.4 (when death of the cells takes place). If the living cells are placed in 0.002 per cent dye solutions of brilliant cresyl blue at different pH values (from pH 6.6 to pH 9), it is found that the rate of penetration of the dye, and the final equilibrium attained, increase with increase in pH value, which can be attributed to an increase in the active protein (or other amphoteric electrolyte) in the cell which can combine with the dye."

Notes on differential ion absorption by plants in relation to reaction changes in nutrient solutions, A. L. PRINCE, L. H. JONES, and J. W. SHIVE (*New Jersey Stas. Rpt. 1922, pp. 378–383, figs. 2*).—A report is given of an investigation made to determine, if possible, whether any correlation exists between the change in the pH values of nutrient solution in contact with plant roots and the absorption of certain ions by the plants.

Soy beans were grown in a three-salt nutrient solution for three weeks or more, the solution being renewed every three days. It was observed that the nitrate ions were taken up by the plants much more rapidly than the calcium ions, and that differential absorption tended to decrease the H-ion concentration of the solution. The potassium ions were absorbed by the plants at a much higher rate than the phosphate ions, and this would tend to increase the H-ion concentration of the solution. It was assumed that the absorption of magnesium and sulphate ions by the plant roots had little effect upon the reaction change, since these ions were taken up very slowly and at about the same rate.

It appears that the reaction change toward the neutral point of nutrient solutions in contact with the roots of growing green plants is directly related to and primarily caused by the high rate of nitrate absorption as against the low rate at which calcium is taken up.

Similar experiments were conducted with a solution in which ammonium sulphate was substituted for calcium nitrate as a source of nitrogen for the plant, the plants being grown in a three-salt solution and renewed as mentioned above. Analyses of the solution after having been in contact with the plant roots showed that the ammonia ions were absorbed at a much higher rate than the sulphate ions, and this is held to indicate that the reaction change from lower to higher H-ion concentration is chiefly a result of differential absorption of ammonia and sulphate ions.

When ammonium sulphate was superimposed on the three-salt solution used, or where this salt was substituted for postassium nitrate in a Tottingham solution, the H-ion concentration of the solution increased during the early stages of the growth of the plants, but the rate of increase was not nearly so high as it was when ammonia ions alone furnished the source of nitrogen. Quantitative analyses showed that the plants drew heavily upon the ammonia ions during the early stages of growth and less heavily upon the nitrate ions, but during the later stages of development this condition was reversed.

Notes on the influence upon plant growth of volume of culture media and on reaction change in two types of nutrient solutions, R. M. BARNETTE

(*New Jersey Stas. Rpt. 1922, pp. 394, 395*).—Comparisons are reported between wheat plants grown in different volumes of Tottingham's solution and in Jones and Shive's ammonium sulphate modification of this solution.

Within certain limits the dry weights of the plants grown in both types of the solution increased as the volume of the nutrient solution was increased. A study of the appearance of the plants during the growing period is said to indicate that the availability of iron to the plants, whether supplied as ferric phosphate or ferrous sulphate, depended upon the reaction to which the growing plants would bring the solution, the iron being less available in the less acid solutions and quite available in the more acid ones. Considering the fact that the formation of nitrogen in the different solutions varied, it is stated that the direction and magnitude of the reaction change produced in a given volume of solution depends upon the formation of nitrogen in the solution, the demand of the plants for nitrogen, and the buffer action of the solution. The continual decrease in the H-ion concentration of the Tottingham solution is attributed to the removal of the nitrate ions from the solution with a consequent excess of the potassium and calcium ions, while the increase in the H-ion concentration of the Jones and Shive modification is attributed to the removal of the ammonium ions from the solution with a consequent excess of the sulphate ions.

It is concluded that in the early stages of growth all the wheat plants drew more heavily upon ammonium nitrogen than they did upon nitrate nitrogen when both were available. During the later stages of growth the demand of the plants for nitrate nitrogen appeared to increase, or that for the ammonium nitrogen to decrease, or both, since at this stage of development the plants decrease the H-ion concentration of the medium.

Effect of aeration and continuous renewal of nutrient solutions upon the growth of barley and buckwheat in artificial culture, R. V. ALLISON (*New Jersey Stas. Rpt. 1922, pp. 402–407, pls. 2*).—In a previous publication (E. S. R., 48, p. 328) the author reported upon the growth of soy bean plants under conditions of aeration and renewal of solutions, and the purpose of the present study was to determine the effect of similar treatment on the growth of barley and buckwheat.

It was found that solutions in contact with the roots of barley plants consistently decreased in H-ion concentration through the action of the plants. Buckwheat, on the other hand, increased the H-ion concentration of the solution. This is held to indicate that absorption from these solutions by buckwheat plants is of a different type from that shown by the barley plants. It was further found that the tendency of the continuous renewal of the nutrient solution to retard reaction change produced by the action of the growing plants is quite pronounced.

The leaf area and yields obtained with buckwheat from the aerated cultures were in every instance much superior to the corresponding yields from the simple solution cultures and the drip solution cultures. The data obtained from the plants in the barley series show results quite similar.

The present experiment with buckwheat and previous ones with soy beans are said to have shown that during the later stages of development from flowering to maturity the superior root development of the aerated cultures manifested itself in greatly accelerated growth rates and markedly superior yields.

Effect of aeration and continuous solution renewal on the salt requirements for soy beans in water cultures, J. W. SHIVE (*New Jersey Stas. Rpt. 1922, pp. 374–377, fig. 1*).—In connection with investigations on the salt requirements of plants, special attention was given to the continuous renewal of the nutrients and constant aeration of the culture solutions. Experiments showed that the dissolved air was quickly removed by growing plants, and where constant aeration was adopted soy beans developed a very efficient root system which was reflected in the more rapid growth of the plants, particularly during the later stages of development.

Comparisons were made of soy beans grown in culture solutions in which the proportions of calcium, potassium, and magnesium were varied, the highest yields of tops and roots being definitely associated with the low proportions of calcium nitrate and potassium phosphate and with high ones of magnesium sulphate. It appeared that potassium phosphate had less influence in determining the growth rates of soy bean plants during the seedling stage than either of the other two salts.

Comparison of iron from some organic compounds as an essential constituent of nutrient media for plants, R. P. Marsh (*New Jersey Stas. Rpt. 1922, pp. 399–402*).—The results are given of an experiment made to determine which of the compounds, soluble ferric phosphate, ferric glycero phosphate, ferric tartrate, ferric citrate, or ferric acetate, is the most efficient for preventing the chlorotic effects of wheat, barley, and oat plants grown in Shive's culture solution. During the progress of the experiments ferric acetate and ferric citrate were discontinued. Of the remaining compounds used, all appear to be equally efficient in maintaining health and vigor of the plants of the species tested. The highest weight of wheat was produced with soluble ferric phosphate, the highest yields of barley with ferric tartrate, and of oats with ferric glycero phosphate.

Response of germinating corn and white grubs to paradichlorobenzene and similar chemicals, G. W. Fant, W. D. Moore, and A. Peterson (*New Jersey Stas. Rpt. 1922, pp. 465–473, pls. 8*).—Paradichlorobenzene having been found to be very efficient for control of certain insects, experiments were conducted to determine its effect on germinating corn. It was found that the roots and root taps were stunted by the chemical and, further, that the diameter of the developing tap and lateral roots as a rule was considerably increased. These enlarged portions did not continue to function, and death of the area ensued. Usually a watery decay was produced by saprophytic fungi.

A number of other chemicals were tested, most of which produced injury to the plants.

GENETICS.

General cytology, edited by E. V. Cowdry (*Chicago: Univ. Chicago Press, 1924, pp. VII+754, pls. 9, figs. 173*).—This is a cooperative work prepared by investigators at the Marine Biological Laboratory at Woods Hole, Mass., dealing with the principles which govern cellular structure and function. The following have contributed to the work: Introduction, by E. B. Wilson; Some General Aspects of the Chemistry of Cells, by A. P. Mathews; Permeability of the Cell to Diffusing Substances, by M. H. Jacobs; Reactivity of the Cell, by R. S. Lillie; The Physical Structure of Protoplasm as Determined by Microdissection and Injection, by R. Chambers; Cytological Constituents—Mitochondria, Golgi Apparatus, and Chromidial Substance, by E. V. Cowdry; Behavior of Cells in Tissue Cultures, by W. H. and M. R. Lewis; Fertilization, by F. R. Lillie and E. E. Just; Cellular Differentiation, by E. G. Conklin; The Chromosome Theory of Heredity, by C. E. McClung; and Mendelian Heredity in Relation to Cytology, by T. H. Morgan.

Cytological studies of diploid and polyploid forms in raspberries, A. E. Longley and G. M. Darrow (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 10*, *pp. 737–748*, *pls. 3*).—Studies of the pollen mother cell development in species and varieties of Rubus used in raspberry breeding investigations, conducted by the U. S. Department of Agriculture, showed the majority of the raspberries utilized to possess 7 haploid chromosomes. Four European varieties, La France, Merveille Rouge, Merveille de Quatre Saisons Rouge, and Surpasse Merveille a Blanc, found to possess 14 haploid chromosomes, produced, with the exception of La France, only small percentages of viable pollen. Four forms, White Queen, All Summer, Erskine, and La France×Ranere, were found to have a haploid count of $\frac{21}{2}$, a figure believed indicative of a parental combination of 14 and 7 chromosomes.

With two exceptions (All Summer and White Queen) the polyploidous forms were relatively sterile. This fact, taken in connection with irregularities observed in the chromosome distribution in meiosis, leads the authors to infer that raspberries showing pollen sterility are probably of hybrid origin, and that such polyploidous forms are the result of crosses between plants belonging to different chromosome groups. The discovery of characters in polyploid raspberries similar to those in *Rubus caesius*, a tetraploid trailing European blackberry known to be capable of crossing with *R. idaeus*, leads to the suggestion that all polyploidous raspberry forms considered in the article may be raspberry-blackberry hybrids. Polyploidism, though increasing the difficulties of the plant breeder attempting interchromosome group crosses, increases the chance of obtaining new combinations of characters.

Study of bud variation in Codiaeum variegatum, N. B. Mendiola and J. R. Maggino (*Philippine Agr.*, *11* (*1922*), *No. 1*, *pp. 19–22*, *pls. 2*).—"Bud variations in the species *C. variegatum* were produced by manuring, or by growing the plant in soil containing 50 per cent sand and 50 per cent ordinary farm soil, or by exposure to the sun or by artificial shading for more than 1.5 years.

"A case of terminal and one of lateral bud mutation involving the same shape of leaf, and a change from broad to slender shape, was found in one variety. . . . In this variety also a bud mutation consisting in a change from green leaves spotted with yellow to leaves practically entirely green was found.

"An interesting case of a suspected bud mutation was found in which leaves tend to become a two or three part affair, the parts being connected with a tendril-like structure or bare midrib. Nonheritable bud variations were found which were due probably to the varying conditions of nourishment, light, temperature, and possibly other elements present in the environment."

The inheritance of head form [trans. title], A. Schreiner (*Genetica* [*The Hague*], *5* (*1923*), *No. 5–6*, *pp. 385–454*, *figs. 15*).—A study has been made at the Anatomical Institute at Christiania of the relaion between the head length, breadth, and the height of individuals. The people measured included several types of heads which were obtained from different localities, 101 males and 90 females from Haalandsdal, 42 males and 39 females from Upper Eidfjord, 111 males and 80 females from Luster and Hafslo, and 218 individuals from Tysfjord, as well as 3 other small families. The measurements of the individuals were studied with regard to the kinship of each, and the conclusions as to the inheritance of the head types were variable. The author, however, makes the final statement that head form is due to several hereditary factors, as well as other conditions, the nature of which has not yet been determined.

The probable mechanism of heredity in the present day sugar beets and the possibility of further improvement of the type [trans. title], O. Munerati (*Ann. Bot.* [*Rome*], *16* (*1923*), *No. 1, pp. 122–138*).—The mechanism supposedly related to heredity in sugar beets is outlined.

A new dominant color pattern and combinations that breed true in the grouse locusts, R. K. Nabours (*Genetica* [*The Hague*], *5* (*1923*), *No. 5–6, pp. 477–480, pl. 1*).—In work from the Kansas Experiment Station, the character in the grouse locust (*Paratettix texanus*) originally referred to as IS (E. S. R., 40, p. 367) and thought to be due to linkage of several characters has been found to be due to a dominant factor Sm. This character has segregated alternately from the original pattern S and from 11 other multiple allelomorphs with which it has been combined. These mutants are compared with various types which have been found in *Apotettix eurycephalus*.

Studies on the relation between tumor susceptibility and heredity, I, C. J. Lynch (*Jour. Expt. Med.*, *39* (*1924*), *No. 3, pp. 481–495, figs. 3*).—A preliminary report is given of the results of experiments conducted at the Rockefeller Institute for Medical Research dealing with the inheritance in mice of susceptibility to tumors of the mammary gland. Females from tumor strains were mated with males, and the occurrence of tumors in the F_1 and F_2 females and in females produced by back-crossing females of tumor stock to the F_1 males was recorded. It was found that some of the daughters of all but 2 of the 15 males used developed tumors.

A summary of the tumor occurrence in the female descendants of the 7 males of which nearly all the offspring had matured showed that though all these females were from tumor strains only 7 developed tumors, whereas 19 did not. Of the F_1 daughters, tumors occurred in 16 and did not occur in 34. Twelve of the F_2 daughters developed tumors, whereas 77 did not. The females selected for back-crossing developed tumors in 19 cases, whereas 87 did not, and of the daughters produced in the back-cross, tumors occurred in 50 and did not occur in 109. The tumors also appeared at a younger age in the back-crossed females than in the F_2s.

The author concludes from the data that the tendency to develop neoplasms is due to an heriditary factor which is dominant, but that homozygous dominant individuals, though they are susceptible to tumor formation, do not necessarily develop tumors, as such factors as irritation due to breeding and rearing the young are probably contributory factors.

Interrelations of genetic factors in barley, K. S. Hor (*Genetics*, *9* (*1924*), *No. 2, pp. 151–180*).—Ten factor pairs and one triple-allelomorph series in barley were considered at the University of California, and evidence has been presented for linkage or independent assortment among them.

A linkage group, including the factors concerned in the color of the kernel, the texture of the awn, and the length of hair on the rachilla, and a second group including the factors concerned in the adherence of the lemma to the caryopsis and the extent of pubescence on the outer glume, were definitely established in this study. Linkage probably exists between the factors concerned in the fertility of the lateral floret and the extension of the outer glume, which constitute a group separate from the other two. Study of the distribution of the density of the spike in an F_2 population indicates that one or more density factors probably lie in the second group mentioned, agreeing with findings in previous work. The linkage groups of barley determined thus far by different investigators have been brought together in the discussion.

Studies on the sex-ratio and related phenomena.—I, Foetal retrogression in mice, A. S. Parkes (*Roy. Soc.* [*London*], *Proc.*, *Ser. B*, *95* (*1924*), *No. B 671, pp. 551–558, fig. 1*).—In this study of the importance of fetal retrogression in mice at the University College, London, the author first killed pregnant females about one day before parturition and sectioned the ovaries to determine the number of corpora lutea present. It was found that 74 full-time fetuses were recovered for 82 corpora lutea, indicating a loss of 10.8 per cent of the ova.

In continuing this study, the effect of suckling on implantation of the embryo was studied. Males were placed with females for 24 hours after the birth of the first litter. Four females fertilized in this way were allowed to have the young suckle for an interval up to 6 days, whereas 4 other females similarly treated were allowed to have their young suckle to the later stages of pregnancy. The females were killed as soon as pregnancy was noticeable and, based on the corpora lutea counts, there was a loss of 17.6 per cent ova in the females suckling their young for a short period as compared with 28.1 per cent for those suckling their young for a longer period. The author concludes that the immediate following of one litter by another and, still more, the long suckling period increases the amount of embryonic elimination.

In estimating the sex ratios of the abnormal fetuses, it was found that the ratio in over 1,000 normally bred mice was 118 males to 100 females, while in 14 litters containing 92 young where the females were suckled less than 6 days, the ratio was 80.4 males per 100 females, and in 7 litters of 47 young where the mothers were suckled more than 6 days the ratio dropped still further to 62.1. The author concludes that it is difficult to doubt that prenatal mortality and retrogression falls most heavily upon the male fetuses. No new explanation of the greater embryonic mortality of males is suggested by the author.

Studies on the sex-ratio and related phenomena.—II, The influence of the age of the mother on the sex-ratio in man, A. S. Parkes (*Jour. Genetics, 14 (1924), No. 1, pp. 39–47, figs. 2*).—An analysis of 8,384 births occurring in St. Mary's Hospital, Manchester, from 1911 to 1920 showed that the sex ratio of the infants declined with the age of the mother from 163.8 males per 100 females for mothers from 13 to 17 years of age to 84.6 males per 100 females for mothers over 43 years of age.

During the period of this study there were 1,659 abortions, or 19.8 per cent of the births. A number of other investigators have shown that the sex ratio of aborted fetuses may be placed at 150, though the sex of the abortions at this hospital is not recorded. A classification of the number of abortions per 100 births showed that they steadily increased from 1.7 for mothers of from 13 to 17 years of age to 41.4 for mothers over 43 years of age. The number of abortions per 100 births also increased with the number of the pregnancy from 5.7 for the first to 48.8 as the average for the fifth, sixth, and seventh pregnancies. Similar conditions as to the age of the mother and number of pregnancies were found for stillbirths. Sexually differential prenatal mortality is thus concluded to be the cause of the low sex ratio of the births of the older mothers rather than a faulty theory of sex determination by the heterozygous parent (male).

The question of the male ratio in humans [trans. title], R. Fetscher (*Arch. Rassen u. Gesell. Biol., 15 (1924), No. 3, pp. 233–249*).—A study of the sex ratios of the offspring of 1,796 families, in which the first-born children were 930 girls and 866 boys, is given. The total number of children born in these families was 5,897 boys and 5,416 girls. It was found that the average ages of the parents were practically identical for those in which the first-born were boys and for those in which the first-born were girls.

The ratio of the sexes was studied from the effect of the age of the parents, number of the birth, etc. It was concluded that the increased number of boys among the total children was probably hereditary, and that it is probably associated with the age and the number of the births of the mother, since the ratio of the males per 100 females among the children was increased as the age of the mothers increased and with successive births. No influence of the father on the determination of the sex of the children was apparent.

Intersexuality in Lymantria dispar L. as influenced by temperature [trans. title], N. Emeljanoff (*Biol. Zentbl., 44 (1924), No. 3, pp. 106–110, figs. 4*).—Types of intersexual males and females observed in an experiment in which about 700 6- to 24-hour-old pupae of the gipsy moth were exposed in warm (37 to 40° C., one to three times for 24 hours), and at cold temperatures (6 to 8° for from 14 to 41 days) are described. About two-thirds of the moths produced in these experiments at both temperatures showed character changes toward those of the opposite sex, and many did not produce normal sperms or eggs.

Some remarks on the principles in inbreeding, J. Baashuus-Jessen (*Hereditas, 5 (1924), No. 2, pp. 231–240*).—This is a discussion of inbreeding and the difficulties in the production of homozygosity in the breeds of domestic livestock. The continuance of desirable characters of an individual by parent and offspring matings is suggested rather than by brother and sister matings, as the author believes there would be a greater concentration of the blood.

The subdivision of individuals in genetic research, O. Munerati (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 2 (1924), No. 1, pp. 22–26, pls. 3*).—Attention is called to the possibilities of subdividing individual plants in studying self-sterility, debility due to inbreeding, and reaction to environment. Root crops, corn, and rye are examples cited in a description of technique.

Acclimatization and the transmission, hereditarily, of acquired characters [trans. title], W. Oetken (*Beitr. Pflanzenzucht, No. 5 (1922), pp. 83–104*).—Conclusions to this contribution, which was discussed by several persons named, are to the effect that influences playing upon an organism during its individual life are not without residual effect on posterity, and that the structure of the hereditary material, which in the last analysis is chemical in character, in all probability has a certain elasticity or modifiability.

Note on Kammerer's experiments with Ciona concerning the inheritance of an acquired character, H. M. Fox (*Jour. Genetics, 14 (1924), No. 1, pp. 89–91, pl. 1*).—In contrast to the results of Kammerer in which he got regeneration of amputated siphons of *C intestinalis* to abnormal lengths, the author amputated the siphons of 59 individuals once, 35 individuals twice, and 8 individuals three times, with the result that regeneration to the normal length occurred in all cases.

A note on "feminine" behavior in adult male rats, C. P. Stone (*Amer. Jour. Physiol., 68 (1924), No. 1, pp. 39–41*).—An account is given of two male rats frequently used as testers for females for breeding which were observed to assume the feminine position of copulation from time to time and allow other males to mount them. Both of these males had produced young, and a study of the genital tract of one of them showed that it was perfectly normal.

Vitamin-A and exercise in relation to follicular atresia in the opossum, C. Hartman (*Amer. Jour. Physiol., 68 (1924), No. 1, pp. 97–102, figs. 4*).—An experiment to determine the effect of vitamins on a type of follicular atresia found in confined opossums is briefly reported from the University of Texas. No benefits to the breeding ability of opossums were observed by adding substances containing vitamins A, B, or C to the ration, but when animals which had previously been confined in cages 2 by 2 by 2 ft. were allowed the run of a 12 by 14 ft. room, two-thirds of the animals immediately ovulated, indicating that a lack of exercise was probably the disturbing factor.

FIELD CROPS.

[Field crops work at the Duluth, Minn., Substation, 1922–1923], M. J. Thompson (*Minnesota Sta., Duluth Substa. Rpt. 1922–1923, pp. 7–11, 11–20, 26, 27, figs. 3*).—Among the varietal leaders at this substation (E. S. R., 48, p. 331) have been Mindum wheat, Victory oats, Svansota barley, Swedish rye, Howe Alberta Flint corn, and Green Mountain potatoes. The optimum dates of seeding appeared to be about September 1 for winter rye, May 1 for oats, and May 15 for barley, with 3 bu. as the best acre rate for oats and 2 bu. for barley. Disking for grain after a cultivated crop was less expensive than plowing and increased the yield more than 10 per cent.

Although sunflowers in 30-in. rows gave the largest yields, 36-in. spacing seems more practical. Setting a Van Brunt drill to plant 4 pk. of wheat per acre appeared to be proper for seeding sunflowers. Sunflower plantings made about May 15 have averaged highest, fall plowing has given better yields than spring plowing, and drilling surpassed check rowing. Sunflowers produced about 65 per cent more silage per acre than corn.

Yield differences were slight in comparisons of ridging v. level culture and drilling v. check rows for potatoes. Potatoes in 30-in. rows have produced much heavier than those in 36- or 42-in. rows, and those on spring plowed land outyielded potatoes on fall plowing. Yields declined progressively from 401 to 94 bu. per acre, with dates of planting from May 17 to July 1. In tests with certified seed in 1923, extreme variation was seen in yields of different strains within the same variety of potatoes. Although a complete fertilizer increased the yield of potatoes 44 bu. over the checks, the increase was not thought economical at current prices.

During five years the 3-year rotation surpassed the 4- and the 5-year rotations in yields of hay, grain, and sunflowers.

Notes are also given on cultural studies with alfalfa, sweet clovers, and a number of soiling crops.

[Field crops work in New Jersey], L. G. Schermerhorn, C. H. Nissley, F. App, and G. W. Musgrave (*New Jersey Stas. Rpt. 1922, pp. 116–118, 264–267, 269–271, 281–291, 305–310, pl. 1, fig. 1*).—Experimental work described in these pages includes variety trials with sweet potatoes, oats, timothy, soy beans, cowpeas, alfalfa, and miscellaneous grasses and legumes; breeding work with potatoes, sweet potatoes, corn, and sweet corn; and fertilizer tests with sweet potatoes.

[Field crops work in Guadeloupe, 1921–22 and 1922–23], C. T. Allder (*Guadeloupe Sta. Agron. Raps., 4 (1921–22), pp. 9–18, 25–49; 5 (1922–23), pp. 9–16, 22–52*).—Experiments with sugar cane varieties and seedlings, legumes, and grasses are reported on in continuation of earlier work (E. S. R., 47, p. 824).

[Agronomic work at the University of Hawaii], L. A. Henke and F. G. Krauss (*Hawaii Univ. Quart. Bul. 3 (1924), No. 1, pp. 6–13, 38–40*).—Varietal trials with sorghums and sorgos, sugar cane, grasses, soy beans, and corn are described briefly. Pigeon peas cut back at least once a year carried over much better than when not cut back. Some loss resulted when cutting was delayed after the pods matured, especially during drought, or from overcutting 2-year-old plants. Hybrid corns whose parent stocks came from Guam and Cuba appeared to be more resistant to the injury of the leafhopper than imported corn belt varieties and were reasonably sure croppers, particularly in the lowlands.

The Woburn Experimental Farm and its work (1876–1921), J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 84 (1923), pp. 110–166*).—A general account of the work carried on at the Woburn Experimental Farm (E. S. R., 50, p. 637) during the period 1876–1921, is given with a summary of the principal results obtained in the continuous culture of wheat and barley; rotations; green manuring; experiments with pastures and meadows; weed control; and variety trials and miscellaneous tests with cereals, grasses, legumes, and root crops. Fertilizer, pot culture, and feeding tests are also commented on.

[Field crops work in Madras, 1922–23], R. D. Anstead (*Madras Dept. Agr. Rpt. 1922–23, pp. 6–9, 10, 11*).—The progress of experiments with field crops is reported as heretofore (E. S. R., 50, p. 433).

The pasture problem in Iowa, W. H. Stevenson, L. W. Forman, and P. E. Brown (*Iowa Sta. Circ. 89 (1924), pp. 3–15, figs. 2*).—Practices designed to build up old blue-grass pastures and to maintain them at maximum productivity are discussed in this circular. Experimental results at the station indicate that these aims may be accomplished by disking, reseeding, manuring, and proper fertilizing. The commercial fertilizers used were of little use on disked pasture on the soil type, but manure was very effective in increasing the yield. On disked and reseeded pasture the manure also showed distinct increases, but much larger benefits were noted where the commercial fertilizers, particularly the phosphorus carriers, were employed. Definite increases were also seen where the fertilizers and manure were added without reseeding, in which case ammonium sulphate and a complete commercial fertilizer seemed most effective. Test of combinations of commercial fertilizers on disked pasture again showed the advantage possible in the case of acid phosphate. The addition of acid phosphate, sodium nitrate, and potassium chlorid in combination produced the most distinct gain on disked reseeded plats with manure. Ammonium sulphate gave the largest increase for any single material.

The yields and duration of pure timothy and of seed mixtures on a lower moor with and without loam and sand and variously fertilized during the period 1916–1922 [trans. title], E. F. Simola (*Wiss. Veröffentl. Finnisch. Moorkulturver., No. 4, (1923), pp. 127, pls. 3*).—The yields, duration, and botanical composition of plats on lower moorland untreated, receiving sand and loam, and variously fertilized and seeded to pure timothy and to a mixture of timothy, red clover, alsike, orchard grass, meadow fescue, and blue grass, were subjected to detailed study from 1916 to 1922, inclusive. The response of the several grasses and clovers to the different treatments is described at some length. See also another report from this station (E. S. R., 50, p. 533).

The differences between the average yields from the first cuttings of the timothy and of the mixture were comparatively slight on unloamed, unsanded, and sanded land, whereas the mixture excelled on the loamed land. The second cutting of the mixture was generally more productive than that of pure timothy. The quantity and botanical composition of the hay were decidedly affected by the addition of loam and sand to the moor soil. Fertilizing the moor soil, whether loamed and sanded or untreated, with phosphoric acid alone or in combination with potash has been of very great importance as regards the amount and composition of the hay. Weather conditions during the separate years influenced the yields and the persistence of the grass plants very strikingly.

An improved method of lucerne cultivation, II, A. Howard (*Agr. Jour. India, 19 (1924), No. 3, pp. 276–279*).—Alfalfa seeded on beds (E. S. R., 46, p. 728) gave a total yield more than 10 per cent greater than that sown on ridges at Pusa during the season of 1922–23. The saving of irrigation water in the bed system was estimated to be about 25 per cent. Preliminary experiments by I. Banerji indicate that the fertilization of the alfalfa flower is limited by temperature at Pusa. Although well-developed pollen grains are formed even in the hottest weather, they do not germinate unless artificially cooled.

Lucerne culture in South Africa, H. D. Leppan (*[Pretoria]: South Africa Central News Agency, Ltd., 1924, pp. 68, pls. 8, figs. 7*).—A practical treatise on the production of alfalfa under South African conditions.

The possibilities of creeping bent grass, M. E. McCollam (*Western Washington Sta. Bimo. Bul., 12 (1924), No. 2, pp. 26–30, figs. 2*).—The habitat, characteristics, propogation, and uses of creeping bent grass are commented on, with suggested methods for harvesting seed.

Experimental activities of the Rhenish Potato Research Institution in 1922 and 1923 [trans. title], T. Remy (*Veröffentl. Landw. Kammer Rheinprov., No. 1 (1924), pp. 55*).—Investigations with potatoes carried on in the Rhine Province, Germany, in 1922 and 1923 and described as heretofore (E. S. R., 47, p. 633) included varietal, cultural, fertilizer, and storage trials and tests of seed stock.

Results of rice experiments at Cortena, 1923, and progress in experiments in water grass control at the Biggs Rice Field Station, 1922–23, C. F. Dunshee and J. W. Jones (*California Sta. Bul. 375 (1924), pp. 3–38, figs. 6*).—The progress of experiments with rice is reported on in two parts.

I. *Results of rice experiments at Cortena in 1923*, C. F. Dunshee (pp. 7–22).—The effects of methods and dates of seeding and submergence on water-grass control and rice yields were very similar to those already noted (E. S. R., 49, p. 34).

C. F. Shaw obtained no positive experimental evidence to show that rice culture has caused any measurable change in the physical character of the Willows clay and Stockton clay adobe soils. In chemical studies on water and soils, by P. L. Hibbard, it appeared that the irrigating water from the Sacramento River is of good quality and varies little throughout the season. Drainage from rice fields flooded for two or more years is likely to be of fairly good quality for irrigation, but, if the soil contains much alkali or salts within 2 ft. of the surface, these soluble substances sometimes may render the drainage unsuitable for irrigation. Since rice is relatively tolerant of saline water, it seems feasible to use drainage from one field to irrigate the next lower field, and so on until the water becomes too saline for further use. In the clay soils, as at Cortena and in Glenn County, most of the salts removed by rice culture are carried away in the surface run-off rather than in the underground drainage. The flooding incident to rice culture would, in two or three years, carry the alkali salts in the calcareous silt soils in Imperial Valley so far below the surface that they would not be troublesome again to ordinary crops and perhaps not to trees.

No very great difference was apparent between the fallow and the rice soils as regards microorganisms. Although some kinds of bacteria are less active in soil which has been flooded, such a soil will probably soon produce ordinary grain crops successfully again. Since the rice soil is most likely deficient in nitrates, some time must elapse before it is again well supplied through the usual agencies. The soil did not seem to be permanently injured by rice culture.

II. *Progress in experiments on water-grass control at Biggs Rice Field Station, 1922–23*, J. W. Jones (pp. 23–38).—Extensive experiments (E. S. R., 49, p. 433) in water-grass control and different seeding practices and methods of irrigation with rice were made by the Bureau of Plant Industry, U. S. D. A., at the Biggs Rice Field Station during 1922 and 1923. Current results may be summarized as follows:

Rice sown broadcast and immediately and continuously submerged, or sown broadcast in the water and kept submerged thereafter, appears to mature from 7 to 10 days earlier and to develop into better plants than rice irrigated in the old way, depending somewhat upon the date of seeding. Continuous submergence seems to control the most common forms of water grass and sprangle-top. When rice is drilled and immediately submerged considerable seed appears to rot, often resulting in poor stands and low yields. When rice is drilled or broadcasted and irrigated lightly for from 2 to 4 weeks to bring it up before permanently submerging, shallow submergence at 2 and 4 in. apparently does not control the water grass. Submergence at 6 and 8 in. aids in controlling water grass, but such depths also suffocate so much rice that low yields are produced. Such weeds as spike rush, slender aster, cat-tail, canary grass, and perennial sedge reduce the yields below profitable limits when rice is grown on a seed bed prepared merely by disking stubble land. Good spring plowing aids materially in the control of these weeds.

Seeding experiments indicate that rice should be sown at a higher rate when it is grown by continuous submergence immediately after broadcasting than when it is grown by the old method of irrigation. On land foul with cat-tail a heavy rate of seeding (200 lbs. per acre) does not help to control cat-tail, but good stands seem to aid in preventing cat-tail from entering a clean rice field. Less seed appears to be needed for good stands when rice is broadcasted in the water than when broadcasted on the soil and then submerged. The rate of 150 lbs. per acre will probably be enough when rice is grown by the old method of irrigation on old land.

The influence of lime on the yield and the nitrogen content of soy beans—season 1921, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1922, pp. 355, 356*).—In the ninth year of this experiment (E. S. R., 48, p. 337), varieties of soy beans grown on both limed and unlimed plats produced respective average acre yields of 17.1 bu. of dry beans with 1,667 lbs. of dry stalks per acre and 1.25 bu. with 197 lbs. The average acre recovery of nitrogen was 79.6 lbs. from the limed plats and 7.9 from the unlimed. Manchu with 24.3 bu. of beans per acre made the highest yield of the varieties grown only on limed plats, while Edna with 19.5 bu. and Swan with 19 bu. led those grown on both limed and unlimed land. Each year the limed beans returned about twice as much nitrogen as is returned by an ordinary crop of corn, wheat, or hay, and after nine years showed no nitrogen deficiency, nor did the soil get perceptibly poorer in nitrogen.

Some studies in connection with the development of the sugar cane, H. A. Tempany (*Mauritius Dept. Agr., Sci. Ser., Bul. 9 (1923), English ed., pp. 16, pls. 5, fig. 1; also in La. Planter, 72 (1924), No. 19, pp. 373–376, figs. 13*).—This group of studies describes the underground system of the sugar cane, traces the development of a stool from a cane cutting and the changes in the stem during development, and indicates the functions of stored sugar in the stem of sugar cane. The similarity of the development processes of the plant arising from an eyebud on a rhizome with those of one originating from an eyebud on a planted cutting is pointed out.

Studies on M. P. 55, D. K. 74, and White Tanna gave indications that under conditions at Réduit the sucrose in the parent cutting is contributed for the nutrition of the young plant for at least 100 days after planting. During that time at least one-half of the sucrose originally present is used for growth and metabolism. Analyses showed that rhizomes contained much less sucrose, less reducing sugar, and more nitrogen and mineral matter than the aerial portions of the stem, a general resemblance to the composition of the nodes on the aerial portion being noted. The storage of sugar by the stem of the sugar cane appears to be a definite specialization on the part of the plant and only slightly, if at all, the result of human intervention. The probable relation between the characteristic joint length of varieties and vegetative vigor is also considered.

The improvement of sugar cane through bud selection.—Report for 1923, A. D. Shamel et al. (*Hawaii. Sugar Planters' Sta. [Pub.], 1924, pp. [5]+134, figs. 45*).—The scope of this work has been essentially noted from other sources (E. S. R., 50, p. 833; 51, p. 32). Reports of bud selection work with sugar cane on different plantations in Hawaii are given in some detail.

Tucumán seedling canes [trans. title], W. E. Cross (*Rev. Indus. y Agr. Tucumán, 14 (1923), No. 3-4, pp. 37-49*).—The progress of agronomic studies and analyses on sugar cane seedlings produced in Tucumán (E. S. R., 47, p. 737) is reported on for 1922 and 1923.

The burning of sugar cane at harvest [trans. title], W. E. Cross (*Rev. Indus. y Agr. Tucumán, 14 (1923), No. 3-4, pp. 29-36, figs. 2*).—Analyses of Zwinga and Kavangire cane, the foliage of which was burned before harvesting at Tucumán, indicated that the burned cane was entirely suitable for the factory. Under the relatively low winter temperatures during the test deterioration proceeded very slowly, suggesting that when necessary a considerable interval could elapse between burning and milling without the cane suffering serious loss.

The relative value of the annual white, the biennial white, and the biennial yellow sweet clovers, A. C. Arny and F. W. McGinnis (*Jour. Amer. Soc. Agron., 16 (1924), No. 6, pp. 384-396*).—The characteristic properties and behavior of annual white sweet clover were compared with those of biennial white and biennial yellow sweet clovers at the Minnesota Experiment Station and certain substations.

A preliminary trial in 1921 gave yields in dry matter of tops about equal for the annual and biennial varieties, but yields in dry matter of roots very greatly favored the biennials. The protein percentage in the roots of the biennials was also much higher than in the annual variety. Results at University Farm in 1922 confirmed these findings and further indicated that on soils deficient in lime for this crop all the varieties were materially helped by applications of lime, the annual apparently being benefited more than the biennials.

As an average for the trials at four locations in 1922, the annual white variety yielded 15 per cent more dry matter in the tops than the biennial white and 35 per cent more than the biennial yellow. On the heavier soils at Waseca and Crookston the yields of dry matter in the tops were larger than at University Farm, where the subsoil is a gravel. The yields of tops at Duluth equaled those at University Farm. The percentages of protein in the tops of the three varieties were about equal. The annual white variety produced larger yields of tops but lower yields of roots than the biennials. The amount of dry matter in both tops and roots was, with one exception, considerably in favor of the biennial varieties. The protein contents in the roots of the annual white variety were uniformly lower than in the roots of the biennials, averaging 8.44 and 18.34 per cent, respectively. The total production of protein in the tops and roots was 55 per cent greater in the biennial white and 61 per cent greater in the biennial yellow sweet clovers than in the annual white variety.

Wheat in the world, R. MussET (*Le Blé dans le Monde. Paris: Berger-Levrault, 1923, pp. X+199, pls. 3, figs. 2*).—This book discusses the factors involved in and the extent of production of wheat in the several political subdivisions of the world and describes the commercial movements of the crops.

Report of the department of seed analysis, J. G. FISKE (*New Jersey Stas. Rpt. 1922, pp. 185–194, pls. 2*).—The average purity and germination of 1,769 unofficial samples of agricultural seed and the average number of organisms, purity, and inoculation of 35 unofficial samples of legume inoculants are tabulated for the year 1921–22, together with a list of weeds identified.

Studies of germination of beet seed showed that the relative size of beet bolls in a sample is related to the number of sprouts produced. Both exposure to light and to a high temperature proved deadly to *Bacillus radicicola*, indicating that any cultures that have been exposed either to light or a high temperature for any length of time should be discarded as worthless. Pure cultures grown on agar, a culture grown on peat, and soil from an inoculated field were applied plain, with sugar, and with glue to soy beans and cowpeas. The results suggested that the use of an efficient adhesive is of doubtful value in the inoculation of legumes. Although the number of infected points is unquestionably larger with adhesive, fewer nodules apparently tend to give the same nodular weight as a larger number. If a culture of questionable virulence were used, an adhesive would be practicable.

Results of seed and legume inoculant inspection, 1923, J. G. FISKE (*New Jersey Stas. Bul. 397 (1924), pp. 5–67*).—Tabulations show the purity and germination for about 1,400 samples of agricultural seed tested during 1923. The crops and results of inoculation, organisms per package and per acre, and viability guaranties are also tabulated for 44 official samples of legume inoculants.

Recent Indiana weeds, 1923, A. A. HANSEN (*Ind. Acad. Sci. Proc., 39 (1923), pp. 214–216*).—Plants known to have pronounced weedy characteristics and which are new in Indiana (E. S. R., 50, p. 641) or else have recently developed troublesome tendencies include fanweed (*Thlaspi arvense*), knawel or German knot grass (*Scleranthus annuus*), gumweed (*Grindelia squarrosa*), yellow star thistle (*Centaurea solstitialis*), hoary alyssum (*Berteroa incana*), and hare's ear mustard (*Conringia orientalis*).

A weed survey of Indiana, A. A. HANSEN (*Ind. Acad. Sci. Proc., 39 (1923), pp. 216–219, fig 1*).—Results of a survey in 1922 indicate that Canada thistle is the worst weed in northern Indiana and wild garlic in southern Indiana, while whitetop, buckhorn, wild morning-glory, and red sorrel are the leading weeds that are prevalent in all parts of the State. The distribution of the most troublesome weeds in Indiana is indicated on an outline map.

Does Allium vineale L. produce seeds in Indiana? A. A. HANSEN (*Ind. Acad. Sci. Proc., 39 (1923), pp. 213, 214, fig. 1*).—Data from the Indiana Experiment Station suggest that the production of seeds by wild garlic (*A. vineale*) under Indiana conditions is very unusual, while the formation of viable seeds either does not occur or is rare.

The Australian prickly-pear problem, T. H. JOHNSTON (*Austral. Assoc. Adv. Sci. Rpt., 16 (1923), pp. 347–401, pls. 4*).—A comprehensive discussion of the prickly pear (largely *Opuntia* spp.) in Australia dealing with the extent of the infestation and probable further extension, the various species concerned, introduction of the pests into Australia, and attempts to control by legislative, mechanical, chemical, and biological means and by utilization.

HORTICULTURE.

Further study of the relation of various fertilizer mixtures to the growth of celery in muck soil, R. F. POOLE and G. W. FANT (*New Jersey Stas. Rpt. 1922, pp. 395–399, fig. 1*).—In continuation of previously reported work (E. S. R., 48, p. 340), Newark Market celery plants were transplanted into 1- and 2-gal. pots containing Bergen County muck soil in which had been incorporated, after sifting and drying, calculated quantities of various fertilizing ingredients. Nitrogen was obtained half-and-half from sulphate of ammonia and nitrate of soda, phosphoric acid from acid phosphate, and potassium from muriate of potash. All materials were applied at the rate of 1,600 lbs. of the complete fertilizer mixture per acre.

The experiment was divided into two series. The first, using three plants in 1-gal. pots, was started in March and completed in June, 1921, and the second, using two plants in 2-gal. pots, was started in December, 1921, and completed in March, 1922. Averages of the two series showed maximum yields for those cultures receiving fertilizer in the proportion of 6 per cent ammonia, 6 per cent phosphoric acid, and 4 per cent potassium oxid. The average relative yield produced by the leading culture was approximately 19 per cent higher than that produced by the control. In conclusion, the authors point out that, with the soil used in the study, large increases in yield may be expected from an application of from 1,600 to 2,000 lbs. per acre of a complete fertilizer in which the active phosphoric acid, ammonia, and potassium oxid are present in approximately equal proportions. Any disproportionate increase in any one of the three elements may, on the other hand, result in greatly reduced yields.

Lettuce growing in New Jersey, H. F. HUBER (*New Jersey Stas. Circ. 155 (1924), pp. 24, figs. 16*).—A well-illustrated pamphlet in which the various essentials and practices of lettuce production in New Jersey are discussed in detail with a view to assisting the market growers.

Spinach fertilizers, H. H. ZIMMERLEY (*Virginia Truck Sta. Bul. 44 (1923), pp. 281–291*).—Investigations extending over a period of three seasons upon the comparative effect of various forms of nitrogen carriers (used with other materials to form complete fertilizer combinations) on the quantity and quality of spinach grown as a late fall and winter crop showed that nitrate of soda and sulphate of ammonia give approximately equivalent results when both yield and quality are considered. Nitrate of soda was slightly more effective in respect to increasing yield than was sulphate of ammonia, but the use of the latter resulted in superior quality. Tankage gave much lower average yields both when used alone or in combination with nitrate of soda and sulphate of ammonia in complete fertilizers, apparently because of the slow rate of nitrification occurring during the cool months in which the crop was grown. In respect to methods of application, those plats which received four treatments at the rate of 400 lbs. per acre gave a higher average yield than was secured when two treatments of 800 lbs. each were used. For fertilizing large spinach, a mixture of equal parts of nitrate of soda and a good form of drier is preferable to a complete fertilizer. It is recommended that organic forms of nitrogen be applied and mixed with the soil before the spinach is planted and not used as top-dressing.

As a result of the study, the author recommends for top-dressing spinach grown during the winter season on the type of soil used in the investigation a mixture containing approximately 9 per cent of ammonia, 8 per cent of phosphoric acid, and 3 per cent of potash, and made up of 300 lbs. of sulphate of ammonia, 566 lbs. of nitrate of soda, 1,014 lbs. of acid phosphate, and 120 lbs. of muriate of potash.

Cross pollination of tomatoes: Varietal differences in amount of natural cross pollination important factor in selection, J. W. Lesley (*Jour. Heredity, 15* (*1924*), *No. 5, pp. 233–235, fig 1*).—Studies conducted at the Citrus Experiment Station, Riverside, Calif., indicated that a considerable amount of natural crossing occurs in the tomato under California conditions. Two varieties, Magnus and Dwarf Champion, possessing decidedly contrasting allelomorphic characters, were planted in alternate rows. Of 1,360 plants raised from seed saved from Magnus fruits, 2.45 per cent developed the cut type of leaves, characteristic of the Dwarf Champion. Of 1,025 plants raised from seed taken from Dwarf Champion fruits, 3, or 0.29 per cent, were of the standard habit of growth. Laying aside the somewhat remote possibility of mutations, the author suggests that natural crossing evidently occurred in both varieties. He accounts for the significantly greater amount of crossing in Magnus by the fact that the stigma of this variety protrudes beyond the staminal cone, thus affording a greater opportunity for cross-fertilization than in Dwarf Champion, where the stigma was observed to be generally sunk about 1 mm. below the apex of the stamens.

Tomato culture in Missouri, J. T. Quinn (*Missouri Sta. Bul. 212* (*1924*), *pp. 16, figs. 5*).—Utilizing considerable material presented in an earlier bulletin (E. S. R., 47, p. 237) as a foundation and later work as supplemental, the author discusses tomato growing in general, considering such subjects as soil, seed, varieties, plant growing and setting, fertilizers, staking and pruning, and the combating of diseases and insects.

In 1923, fertilizer tests, conducted on a Putnam silt loam of medium fertility, showed the largest yields from the use of 300 lbs. of 2–16–2 fertilizer. A summary of four years' (1920–1923) quantitative fertilizer tests at Columbia, where 125, 250, 500, and 1,000 lbs. per acre of the same material were compared, indicated that 500 lbs. is generally the most profitable quantity. In 1921 and 1922 the 1,000-lb. application gave the highest yield, but the gain was not found adequate to offset the increased cost of material. A summary of five years' (1919–1923) comparison of broadcasting and row drilling of fertilizers indicated that the drilling practice is decidedly the more profitable.

In tests extending over a period of three years, Fusarium wilt resistant tomato varieties not only greatly outyielded ordinary commercial stocks but also maintained their vigor much better.

Report of the department of vegetable gardening, [New Jersey Stations], L. G. Schermerhorn (*New Jersey Stas. Rpt. 1922, pp. 110–115*).—As indicated in the preceding report (E. S. R., 48, p. 339), tomato plants transplanted previously to field setting produce larger yields than do plants grown without this care. In tomato fertilizer tests at Masonville, where there were included various combinations and quantities of fertilizing materials, the maximum yield per acre was obtained from the use of 1,000 lbs. of a 4–8–4 home mixed material applied to station grown plants. A mixture of 100 lbs. of nitrate of soda, 200 lbs. of muriate of potash, and 800 lbs. of acid phosphate is recommended as having given uniformly good results at Masonville and New Brunswick over a 3-year period, producing the maximum tomato yield on the Wolpert farm at New Brunswick in 1921. A strain test of Bonny Best seed stocks obtained from 10 sources showed a yield ranging from 9.34 to 14.25 tons.

[Phenological records at the New Jersey Experiment Stations], M. A. Blake (*New Jersey Stas. Rpt. 1922, pp. 88–93, pl. 1*).—Blooming data for fruits, shade trees, and various ornamental plants are presented and in some cases compared with records for the years 1914 and 1916, believed to be representative of normal conditions in New Jersey.

Report of the department of pomology, [New Jersey Stations], A. J. Farley (*New Jersey Stas. Rpt. 1922, pp. 78–85, pl. 1*).—A brief review of activities under various projects. That potash may be of benefit to peach trees on certain soil types was indicated in preliminary observations in an orchard at Marlton. Considerable progress was attained in the propagating and distributing of promising peach seedlings developed at the stations. The extent of frost injury suffered by various important fruits in New Jersey in the spring of 1922 is summarized by counties.

Propagation and top-working of orchard fruits, R. P. Armstrong and F. J. Rimoldi (*New Jersey Stas. Circ. 158 (1924), pp. 31, figs. 17*).—This circular is prepared in two parts, the first of which, entitled propagation of tree fruits, discusses stocks, budding, root grafting, etc., and the second part, entitled top-working fruit trees in the orchard, relates to various grafting and budding practices employed in the conversion of older trees to more desirable varieties.

Pollination studies with Jonathan and Delicious, E. S. Haber (*Iowa State Hort. Soc. Rpt., 58 (1923), pp. 154–156*).—Apple breeding studies carried on at the Iowa Experiment Station over a period of several years have shown Delicious to be a poor ovule and a good pollen parent. Records showed only 216 seeds resulting from 601 clusters representing hand-pollination of Delicious×15 different varieties. In contrast hand-pollinations of 21 varieties×Delicious, representing a total of 1,536 clusters, yielded 4,298 seeds. One hundred and twenty-eight clusters of Jonathan×Delicious yielded 648 seeds, whereas in the reciprocal cross 68 clusters yielded only 56 seeds.

In order to study the relation of soil fertility to the set of fruit, cross-pollinations were made in the spring of 1923 between blue grass sod grown Jonathan and Delicious trees, part of which were heavily fertilized with nitrate of soda. In no case did the nitrate of soda affect the set of fruit obtained. Observations showed the pistils of Delicious to be often defective, sometimes curled, and in some cases with the stigma either red or brown as contrasted with the pale green color of normal healthy stigmas. Pollen taken from a control Jonathan tree failed to increase the set of fruit on nitrated Jonathan trees. Germination studies showed no difference in the length or rate of growth between the pollen of nitrated and nonnitrated trees of the same variety. Delicious pollen tubes averaged somewhat longer than those of Jonathan.

[Peach breeding at the New Jersey Stations], C. H. Connors (*New Jersey Stas. Rpt. 1922, pp. 97–101, pl. 1*).—Careful observations upon a large number of peach seedlings developed at the stations in recent years have revealed certain valuable facts and principles. Varieties inclined to bear small fruits were found to transmit this tendency to their progeny; for example, Early Crawford, Lola, and Slappy have yielded a large proportion of small fruited seedlings. Lola, a white fleshed variety, was found to carry factors for yellow flesh and earliness. In that none of the seedlings arising from pollen taken from a Dewey tree which in the same season became diseased with yellows showed any evidence of being diseased, it is believed that this serious malady is not transmitted by means of pollen. Seedlings of Elberta × Greensboro were all white and were characterized by large size, bright color, and in most cases poor quality. Killing frosts interfered seriously with the success of breeding work in the spring of 1922. Certain seedlings used as parents are described, and a list is given of new accessions.

Some studies of different forms of summer pruning of peaches, M. A. Blake and C. H. Connors (*New Jersey Stas. Rpt. 1922, pp. 94–97*).—Finding that summer pinching or cutting back of shoots more often stimulates than retards the growth of peaches, six different pruning treatments, namely, (1) no pruning, (2) side branches pruned off, (3) side branches cut back, (4) side branches thinned, (5) girdling, and (6) side branches and leader cut back, were compared, utilizing as material peach trees the first year from seed. From the very start the girdled trees suffered a decided check in height development, the growth of the leader practically ceasing within 10 days of the treatment. Trees with their side branches cut back or cut off made the most rapid height growth toward the end of the season, the pruning of the side branches apparently stimulating the growth of the leader. In respect to trunk diameter, all forms of pruning decreased trunk development below that of the check trees, the degree of reduction being in accord with the severity of the treatment. In the case of girdled trees, diameter enlargement below the wound practically ceased following the treatment, while above the wound a fair gain was recorded.

Fruit setting on J. H. Hale peach, C. H. CONNORS (*New Jersey Stas. Rpt. 1922, pp. 102–105*).—This is a summary of material presented from another source (E. S. R., 48, p. 837).

Investigations of cranberry problems, C. S. BECKWITH (*New Jersey Stas. Rpt. 1922, pp. 449–459*).—A progress report (E. S. R., 48, p. 342) on long-continued fertility and acidity investigations with the cranberry. A tabulation of 1921 yields on plats receiving different quantities of nitrogen in the forms of nitrate of soda, dried blood, and a combination of both showed in every case larger increases with nitrate of soda than with the equivalent amounts of dried blood. On the other hand, a combination of the two materials resulted in as high yields as did nitrate of soda alone. In respect to quantity, larger yields were obtained with 30 lbs. than with 20 lbs. of nitrogen, leading to the practical recommendation that 30 lbs. be applied on poor Savannah soils and 20 lbs. on medium soils.

A study of the effect of different forms and amounts of phosphate fertilizers on Savannah cranberry lands showed the maximum increase over checks, 29 per cent, from the use of 250 lbs. of acid phosphate, which proved a better source of phosphoric acid than did rock phosphate, the yield increases from equivalent amounts of each for the years 1919–1921 being 2, 6, and 21 per cent for rock phosphate and 11, 19, and 29 per cent for acid phosphate. A comparison of 0, 264, 528, 792, and 1,056 lbs. of a mixed fertilizer consisting of 75 lbs. of nitrate of soda, 75 lbs. of dried blood, 300 lbs. of rock phosphate, and 50 lbs. of sulphate of potash showed the maximum increase in yield with the 792-lb. application. Records of yields on plats of muck cranberry land treated with various amounts of rock and acid phosphate showed a maximum gain, 54 per cent above the checks, on that area receiving 300 lbs. of rock phosphate per acre. Records taken in 1921 on 40 plats receiving various fertilizer treatments in 1920 show greatly increased yields from those areas receiving (1) 10 lbs. of nitrogen, 30 lbs. of phosphoric acid, and 10 lbs. of potash and (2) 5 lbs. of nitrogen, 60 lbs. of phosphoric acid, and 5 lbs. of potash. Heavier applications resulted in an excessive vine growth. Potash had no significant effect upon the plants.

A summary of four years' records of yields from plats on Savannah and mud bottom lands treated with various amounts of calcium and magnesium limestone showed a general increase in yield on the limed areas. However, these increases were not apparent until the two years following application on Savannah lands and three years following applications on mud bottom lands. The greatest increase in yield over controls in 1921 on limed Savannah plats was observed on that area to which 2,000 lbs. of high calcium limestone was applied in 1918, and 1919, and 1920. The maximum 1921 increased yield on mud bottom land was secured from that area receiving 2,000 lbs. of calcium limestone in 1918 only. The normal H-ion concentration as indicated by pH values on the cranberry bogs used in these experiments was 4.08, while the range of pH values for the highest yielding plats was from 4.25 to 6.8.

Establishing cranberry fields, G. M. DARROW, H. J. FRANKLIN, and O. G. MALDE (*U. S. Dept. Agr., Farmers' Bul. 1400* (*1924*), *pp. II+38, figs. 35*).—Aided by numerous illustrations, the authors, following a preliminary discussion of the history and botany of the cranberry, present general directions for the construction and planting of cranberry fields. Among the subjects discussed are selection of site, clearing, ditching and draining, water supply, leveling, sanding, varieties, propagation, and planting.

Managing cranberry fields, G. M. DARROW, H. J. FRANKLIN, and O. G. MALDE (*U. S. Dept. Agr., Farmers' Bul. 1401* (*1924*), *pp. II+21, figs. 15*).—This publication, closely related to the above, presents information on the control of insects and diseases, resanding, flooding, frost protection, weather forecasting, fertilization, weeding, pruning, and various seasonal operations.

Cranberry harvesting and handling, H. J. FRANKLIN, G. M. DARROW, and O. G. MALDE (*U. S. Dept. Agr., Farmers' Bul. 1402* (*1924*), *pp. II+30, figs. 34*).—In the same general series as the above, information is presented on picking practices; grading, sorting, and packing; marketing; cooperative organizations; and yields, costs, and returns.

Hastening the coloration of lemons, F. E. DENNY (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 10, pp. 757-769, figs. 3*).—In investigations conducted by the U. S. D. A. Bureau of Chemistry to determine the active gases or vapors concerned in the yellowing of lemons picked while yet green in color and exposed to the gases arising from the combustion of kerosene, it was found that, although a surprisingly large number of substances may hasten the yellowing of lemons, most of the materials cause serious injury to the fruit. The residual gas left after a stream of kerosene stove gas was bubbled through Pettenkofer tubes filled with bromin water failed to induce yellowing of lemons, suggesting to the author that the effective constituent must be among the unsaturated hydrocarbons.

In tests of various concentrations of ethylene ranging from 1 part in 1,000 to 1 part in 5,000,000 of air coloring occurred at all concentrations, although requiring different lengths of exposure. Lemons colored with ethylene did not differ in any way from those colored in the usual way with kerosene stoves. Although attempts to isolate ethylene from stove gas were unsuccessful, the author believes that ethylene is present, but in such small amounts as to render detection extremely difficult. High concentrations of ethylene apparently retarded coloring, and in the absence of oxygen ethylene failed to effect coloration. In favorable concentrations, ethylene at low temperatures (45° F.) practically inhibited and at high temperatures (93°) reduced coloring. Yellowing was apparently stimulated by conditions which ordinarily favor the life processes of the fruit. Both ethylene and kerosene stove gas increased the respiration rates of lemons, the CO_2 output being increased from 150 to 250 per cent.

In conclusion, the author suggests that the use of ethylene is commercially practicable in that it may be readily purchased in steel cylinders from which the gas may be released in measured amounts as needed.

Report of the First Date Grower's Institute at Coachella in Coachella Valley, California, February 29th and March 1st, 1924, (*Date Grower's Inst. Rpt., 1* (*1924*), *pp. 36*).—Among the numerous papers included are Program for Improvement of Date Industry, by H. J. Webber; The Chemistry of the Date, by A. E. Vinson; Eradication and Control of Date Scale, by A. J.

Shamblin; Date Palm Insects, by F. Stickney; and Co-operative Quarantine Date Nurseries and Low Temperature Dehydration of Cane Sugar Dates, both by W. T. Swingle.

Sun-drying and dehydration of walnuts, L. D. Batchelor, A. W. Christie, et al. (*California Sta. Bul. 376 (1924), pp. 3-26, figs. 9*).—Of three practices of drying walnuts, namely, (1) sun exposure, (2) unheated ventilated houses, and (3) artificially heated dehydrating plants, the first has always been most important in California walnut orchards and will likely continue to be the most practicable method for the smaller plantations. Studies of commercial walnut dehydrating plants, carried on cooperatively with the California Walnut Growers' Association, show, however, that dehydration has certain advantages over ordinary sun curing principally in the lessened amount of time required to dry nuts and in the assurance of a uniform product despite unfavorable weather conditions that may prevail.

An examination of nuts which had been dried at different temperatures ranging from 100 to 140° F. showed that 110° is the maximum temperature at which a satisfactory product can be obtained. Nuts with high initial percentages of moisture required a lower maximum temperature than those with a lower content. Dehydration reduced nuts to a cured condition in approximately one-sixth the time required for sun drying. Computations based on the results of several tests in 1922 and 1923 showed that, with temperatures of 90, 100, and 110°, 2.56, 2.17, and 1.51 hours were respectively required to evaporate 1 per cent of moisture from a given quantity of nuts. When the heat flow was turned off at night drying practically ceased, thus not only increasing the time required to cure the nuts, but incidentally reducing the capacity of the plant. In respect to the rate of air flow, it was found that 500 ft. per minute was the most profitable velocity, those above being too expensive and those below too slow in results. The first 6 to 12 in. of walnuts in the trays practically determined the volume of air which a given fan could force through the nuts. Records obtained from growers showed that dehydration, because of the greater initial outlay for equipment, is more expensive than sun drying. However, it is believed that the advantages of artificial drying are such as to warrant careful consideration of the process on the part of walnut growers.

Carnation breeding [at the New Jersey Stations], C. H. Connors (*New Jersey Stas. Rpt. 1922, pp. 106, 107*).—Peculiar behavior in respect to sex, namely, the loss of maleness during February and March, was observed in the majority of varieties (seedlings and commercial) used in the study. The loss of maleness was shown either as a more or less complete contabescence of the stamens or a loss of viability in the pollen. It was found that carnation pollen requires a medium of at least 25 per cent sugar for satisfactory growth, and at certain seasons the pollen of certain varieties germinates better on 35 per cent sugar, with either agar or gelatin. Certain commercial varieties, for example, Prosperity, and also certain seedlings never produce well-developed stamens, and three seedlings were observed to fluctuate in rsepect to the presence or absence of the pistil.

Lime studies with hydrangeas (*New Jersey Stas. Rpt. 1922, pp. 107–109, pls. 2*).—A summary of previously reported work (E. S. R., 48, p. 140).

A garden bluebook of annuals and biennials, H. S. Ortloff (*Garden City, N. Y.: Doubleday, Page & Co., 1924, pp. XXII+245, pls. 23, figs. 7*).—This contains popular information on the care, arrangement, and selection of materials for the flower garden.

The practical book of outdoor flowers, R. Wright (*Philadelphia and London: J. B. Lippincott Co., 1924, pp. XXIX+319, pls. 123*).—A general discussion of flower growing, with particular attention to plant materials.

FORESTRY.

Cultural experiments with Douglas fir and other conifers of various origin [trans. title], [E.] Münch (*Mitt. Deut. Dendrol. Gesell., No. 33 (1923), pp. 61–79*).—Cultural experiments carried on near Kaiserslautern, Rhine Palatinate, Germany, with Douglas fir seedlings raised from seed obtained from 10 known sources in the United States showed a distinct correlation between the growth and appearance of the seedlings and the geographical location of the parent trees. The lots from the Snoqualmie Forest of western Washington and the Pecos Forest of New Mexico were far in the lead of the others after 12 years in the plantation, both in respect to height growth and general vigor. An analysis of climatic conditions in the various United States localities and at Kaiserslautern leads the author to believe that the length of the growing season rather than the extremes of temperature is the principal factor determining the adaptability of Douglas fir stocks to German environment. The needles of the fastest growing lot (Snoqualmie Forest) were of a pure green color characteristic of most of the Douglas fir previously planted in Germany.

Behavior of the second generation descendants of foreign Scotch pine stocks [trans. title], [E.] Münch (*Forstwiss. Centbl., 46 (1924), Nos. 2, pp. 45–54, figs. 2; 4, pp. 125–137, fig. 1*).—This is a report upon forest tree growing investigations conducted near Kaiserslautern, Rhine Palatinate, Germany.

Seed taken from trees, themselves grown from imported seed, was sown in the spring of 1913. From the very beginning the plants of foreign origin were found to be inferior in size and vigor to comparable plants of native sources. This was especially true of southern France stocks, which were characterized by a bluish green needle color and were of such poor vigor that they largely succumbed during the first few years. Records taken at the beginning of the second growing season showed 100 of the southern France seedlings to weigh 65 gm. as compared with 143 gm. for seedlings of the best native lot. These differences in vigor and growing ability were maintained subsequent to planting in a permanent forest location. Furthermore, the French stocks were found to be peculiarly susceptible to leaf shedding and other diseases.

Because of some uncertainty concerning the source of some of the stocks, the experiment was repeated with seeds taken from trees comprising a source of seed experiment at Trippstadt. Records taken at the end of the first growing season confirmed the results of the foreoging experiment, the weight of 100 seedlings from Belgium, Rhine Palatinate, Finland, and southern France being, respectively, 164, 102, 94, and 64 gm. As a general conclusion, the author points out that greater care should be exercised in the selection of seeds for forest planting.

The hardwoods of Western Australia, S. L. Kessell (*Perth, West. Aust.: Forests Dept., 1923, pp. 15, pl. 1, figs. 3*).—Two species of Eucalyptus, *E. marginata*, known as jarrah, and *E. diversicolor*, known as karri, which constitute the principal hardwood forests of Western Australia, are discussed in relation to their location, extent, associated species, and properties and uses of the lumber. Brief notes are given on several less important species.

Notes on the structure of wood, M. B. Welch (*[N. S. Wales] Technol. Mus. Bul. 9 (1924), pp. 11, figs. 8*).—Brief observations, based on microscopic examinations, are given upon the wood of various indigenous and exotic trees of Australia.

Report of the division of forestry, [Indiana], C. C. Deam et al. (*Ind. Dept. Conserv. Ann. Rpt., 5 (1923), pp. 48–54*).—Information is given relating to forest accessions, State forest management, nursery operations, etc.

Report of the division of forestry (*Mass. Commr. Conserv. and State Forester Ann. Rpt., 1923, pp. 10–28*).—Similar to that of the preceding year (E. S. R., 49, p. 441), this report is devoted largely to work in the State forests and nurseries and in the suppression of forest fires and devastating insects. Approximately 11,000 acres were added to the State forest area during the year.

Progress report of forest research work in India for the year 1922–23 (*Forest Research Inst., Dehra Dun, Prog. Rpt., 1922–23, pp. [4]+123, pls. 10, fig. 1*).—This is the usual report (E. S. R., 49, p. 745), discussing the forestry investigations throughout the different provinces of India during the year.

Progress report on forest administration in the North-West Frontier Province for 1922–23, E. A. Greswell et al. (*Northwest Frontier Prov. Forest Admin. Rpt. 1922–23, pp. [11]+22+XLIII*).—This is the usual administrative report (E. S. R., 51, p. 347), consisting largely of tabulated data on the output of lumber and lumber products, incomes, expenditures, etc.

[Reports of the Forestry Department for the years ended June 30, 1922, and 1923], L. G. Irby (*Tasmania Forestry Dept. Rpts. 1922, pp. 18, pl. 1; 1923, pp. 16, pls. 5*).—These are the usual administrative reports (E. S. R., 46, p. 739).

The forest officers' handbook of the Gold Coast, Ashanti, and the Northern Territories, T. F. Chipp (*London: Crown Agents for Colonies, [1922], pp. VI+149, pls. 8, figs. 135*).—This report, designed expressly for the assistance of prospective forest officials, contains information relative to the location, extent, and composition of the forests and the present status of forest activities.

Determining the fire hazards in a forest (*Sci. Amer., 130 (1924), No. 5, p. 329, figs. 2*).—Devised by C. G. Bates of the U. S. D. A. Forest Service, the evaporimeter herein briefly described records the rate of loss of water from a flat wick covered surface simulating a leaf, thus indicating the relative humidity of the air and the associated fire hazard.

An ideal vacation land: The national forests in Oregon (*U. S. Dept. Agr., Forest Serv., 1923, pp. IV+56, pl. 1, figs. 60*).—An illustrated pamphlet, descriptive of the scenic and recreational features of each of the national forests of Oregon.

The Pacific Northwest lumber industry and its development, R. W. Vinnedge (*Yale Univ. School Forestry, Lumber Indus. Ser., No. 4 (1923), pp. 26*).—This is an address delivered in December, 1923, at the Yale School of Forestry, in which the author discusses the development and present status of forestry in that region of the Northwest lying west of the Cascade Mountains.

Wood-using industries of North Carolina, R. K. Helphenstine, jr. (*N. C. Geol. and Econ. Survey Bul. 30 (1923), pp. 105, pls. 19, figs. 10*).—Beginning with a discussion of the present condition of North Carolina forests, their location, and constituent species, there are presented, as a result of a survey of operations in 155 wood-working plants, data on the species and the amount of each utilized in the manufacture of furniture, implements, and sundry wooden articles.

Census of industry.—The pulp and paper industry, 1921 and 1922 (*Ottawa: Canada Bur. Statis., Forest Prod. Branch, 1924, pp. 1–60, figs. 2; French trans., pp. 61–84*).—A compilation of statistical information concerning the pulp and paper industry of Canada during the calendar years 1921 and 1922.

DISEASES OF PLANTS.

Aecidiospore discharge as related to the character of the spore wall, B. O. Dodge (*Jour. Agr. Research [U. S.], 27 (1924), No. 10, pp. 749–756, figs. 3*).—During the prosecution of cytological studies on species of rust the author made observations on the development of their aecidia and the origin and discharge of the aecidiospores. Descriptions are given of the formation of germ pores and the development of structures which play an important rôle in spore discharge from the aecidium of *Gymnosporangium myricatum.* Attention is also called to some important differences with respect to these features in the orange rusts of Rubus.

Morphological characters of Alternaria mali Roberts, J. W. Roberts (*Jour. Agr. Research [U. S.], 27 (1924), No. 9, pp. 699–708, pls. 2, fig. 1*).—In a previous publication (E. S. R., 31, p. 150) the author described a peculiar spotting of apple leaves due to *A. mali.* In the present publication a discussion is given of some of the morphological characters of the genus Alternaria based on observations of species from the apple, lilac, cranberry, blueberry, blackberry, and forsythia. *A. mali* is described more fully than formerly.

Nocturnal production of conidia by Sclerospora graminicola, W. H. Weston, jr. (*Jour. Agr. Research [U. S.], 27 (1924), No. 10, pp. 771–784, pls. 2, fig. 1*).—In a previous publication (E. S. R., 49, p. 46) the author gave an account of the nocturnal spore production in two species of Sclerospora destructive to maize in the Philippines. In the present publication an account is given of further studies of the genus Sclerospora with particular reference to *S. graminicola.* It is found that conidiophore production occurs at night only, that during the day there remain only remnants of the previous crop formed, and that the spores and conidiophores can not survive desiccation. The fugacity of the conidial stage, the author believes, has been overemphasized, for although the conidiophores develop only for a few hours each night the development may be repeated night after night for a considerable time during the life of the host.

Co-operative experiments with copper carbonate dust and other substances for smut control, W. P. Fraser and P. M. Simmonds (*Sci. Agr., 3 (1923), No. 9, pp. 297–302*).—Extensive experiments undertaken in 1922 in cooperation with the Dominion Experimental Farms at Indian Head, Scott, and Rosthern in Saskatchewan, and Lacombe in Alberta are outlined, with results in tabular form.

"The results of these experiments show that copper carbonate is the most effective of the dusts tested for smut control. Mixtures of copper carbonate with substances such as fuller's earth, lime, etc., reduce its effectiveness. No seed injury resulted from the use of copper carbonate. The formaldehyde treatment by dipping retarded and reduced germination of wheat, but was not serious enough to be reflected in the yield of the plats. It gave perfect control of smut.

"Where seed is not heavily infected with smut, copper carbonate used as a dust will control smut, and may be recommended. With heavily infected seed formaldehyde treatment will give better results. Where formaldehyde treatment is generally used it does not seem advisable to recommend a change to dust treatment until this method is fully tested. While under certain conditions seed injury may result, yet this is not usually serious enough to affect the yield. . . .

"The dust should be thoroughly mixed with the seed grain; a revolving churn might be used or a machine . . . could easily be constructed. The effectiveness of the treatment depends to a great extent on thorough dusting of the seed. A respirator may be used to prevent inhalation of the dust . . .

"The gas treatment in which paraformaldehyde is heated and the gas is pumped into a wagon box of wheat is unsatisfactory. The vapor condenses on the wheat near the openings for the gas and is not distributed. The presence of this paraformaldehyde is injurious to the germination of the seed. This was shown by growing the treated wheat in pots in the greenhouse. This might be expected as it has been shown . . . that the injury from drying of seed after wet formaldehyde treatment is due to the deposit of paraformaldehyde on the seed when the liquid evaporates."

Experiments on the dust method of smut control, A. KELSALL (*Sci. Agr.*, *3* (*1923*), *No. 9*, *pp. 303–307*).—This is a brief account of experiments relating to control of smut by treatments employing dusts, as applied to Liberty oats. Victory oats and Huron wheat showed too light infection to be of value in the tests.

Water-soluble copper sulphate was more efficient than was the same copper strength in Bordeaux mixture, which in turn was more efficient than the same strength in the form of copper oxid. Ordinary orchard Bordeaux mixture was not effective, due to copper deficiency, lime excess, or arsenic interference. The failure of the modification employed of the formalin treatment is not regarded as significant.

In 1922, Liberty oats were so handled as to secure uniform access of the smut, after which fungicidal dusts were applied. No injury to germination appeared.

"Smut was partially controlled by dust seed treatment with a large range of materials. Under the conditions of this experiment smut control was in no case perfect. Control of smut closely approached perfection in the case of various copper compounds and of elemental sulphur. . . .

"In the very considerable districts where seed treatment is not at present practiced, and in the districts where absolute control is not a necessity, the dust method would probably make a greater appeal to the farmer than the formalin treatment. Also for such grain varieties as Liberty oats, which are known to be highly susceptible to formalin injury, the dust method could be advantageously used. Tentatively copper carbonate could be recommended as a suitable material, or sulphur dust (which is more readily available to everybody) could be recommended in somewhat larger amount than used in the above experiment."

The course of acidity changes during the growth period of wheat, with special reference to stem-rust resistance, A. M. HURD (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 10*, *pp. 725–735*, *figs. 5*).—In connection with an investigation on disease resistance, the author made a study of acidity changes in the wheat plant in reference to resistance to stem rust. It was found that the titratable acidity of the juice of the wheat plant undergoes a regular sequence of changes during development from the seedling stage to maturity. The H-ion concentration of the juice of the wheat plant does not decrease appreciably between the ages of two and six weeks, but it is greatly increased during the preripening period, reaching a relatively high value at the flowering stage and later. This increasing acid concentration is said to be correlated with the rate of drying rather than with head formation or kernel development. Both the titratable acid and H-ion concentration are said to be influenced by environmental conditions which determine the rate of growth and which bring about daily fluctuations in acidity. Stunted, slow-growing plants are characterized by extremely high titratable acid and H-ion concentration. Infection by mildew, when severe enough to visibly affect the vigor of the plant, is said to result in an abnormally high acidity.

It is claimed that varietal resistance to stem rust is not related at any stage of development to titratable acid or H-ion concentration. High acidity of the juice does not tend to hinder attacks of the stem rust organism nor does low acidity predispose the plant to the disease.

Cabbage-seed treatment, J. C. WALKER (*U. S. Dept. Agr., Dept. Circ. 311* (*1924*), *pp. 4, figs. 2*).—Directions are given for the hot water and corrosive sublimate treatments for the control of the seed-borne diseases of cabbage.

Celery blight control, C. H. NISSLEY (*New Jersey Stas. Rpt. 1922, pp. 273, 274*).—An account is given of demonstration work for the control of celery blight, in which the disease was satisfactorily held in check by six applications of a 5-6-50 Bordeaux mixture. In one instance a net profit of $500 per acre was reported.

Celery mosaic, R. F. POOLE (*New Jersey Stas. Rpt. 1922, pp. 567, 568, pl. 1*).—A mosaic of celery is described which is said to have appeared in several localities in New Jersey. The entire plant is usually infected, the younger branches showing a characteristic blister-like effect. In some cases the leaves are severely malformed, wilted, and drooped, while at other times they remain erect, become filiform, and produce a bushy top.

A number of tests were made to determine the possible transfer of mosaic of celery to tomato, turnip, and kale. Aphids were transferred from diseased celery plants to the other plants, but the results in all cases were negative.

Investigation of the horse-radish root rot, R. F. POOLE (*New Jersey Stas. Rpt. 1922, pp. 560, 561*).—In continuation of investigations previously reported (E. S. R., 48, p. 347), the author gives some additional data regarding the bacterial root rot of horse-radish. Storage pits are said to be the main source of infection, and experiments showed that sulphur treatments were effective and caused no injury. The author recommends the planting of clean roots obtained by cutting the ends from all roots and dipping the remaining portion in a corrosive sublimate solution.

The root and stem rot of the pea, W. D. MOORE (*New Jersey Stas. Rpt. 1922, pp. 572, 573*).—The root and stem rot of the pea is said to have been known in New Jersey for at least eight years, and to have become serious within the last three years. The fungus attacks the roots and stems of the pea plant beneath the ground and moves up the stem to the surface, gradually girdling the plant. A species of Fusarium has been repeatedly isolated from diseased material. Greenhouse experiments were made to test the pathogenicity of the fungus, and the plants showed the typical marks of the disease as found in the field.

Investigations on the leaf-roll and mosaic diseases of the potato, P. A. MURPHY and R. MCKAY (*Ireland Dept. Agr. and Tech. Instr. Jour., 23* (*1924*), *No. 4, pp. 344-364, pls. 5, fig. 1*).—Investigation (E. S. R., 49, p. 753; 50, p. 448) has been continued regarding potato mosaic and leaf roll. A summary of climatic or weather conditions for 1922 is given on account of their bearing upon the prevalence of insects, which greatly influences the results secured in the plats. The studies and their results are given in considerable detail.

Virus diseases of potatoes (*Nature* [*London*], *112* (*1923*), *No. 2808, p. 293*).—This is a brief notice of the account of potato virus diseases in Ireland noted above.

The influence of the source of nitrogen on the prevalence of potato scab, W. H. MARTIN (*New Jersey Stas. Rpt. 1922, pp. 596-599*).—Experiments reported, in which various forms of nitrogen were used for fertilizing potatoes and where sulphate of ammonia and nitrate of soda were compared, indicate that the use of sulphate of ammonia as one of the sources of nitrogen will tend to decrease the severity of scab. In another series of experiments, in which sulphate of ammonia, nitrate of soda, and some organic source of nitrogen were compared, there was a decrease in the number of clean tubers in the plats to which nitrate of soda was added and an increase where sulphate of ammonia was employed. Where one-third nitrate of soda and two-thirds sulphate of ammonia were used there was a greater proportion of clean tubers. Plats treated with mixtures containing blood gave as good control as where sulphate of ammonia alone was used. Cyanamid gave a very low percentage of clean tubers.

Experiments with sulfur for the control of potato scab, summary of 1921 results, W. H. MARTIN (*New Jersey Stas. Rpt. 1922, pp. 582–595*).—Cooperative tests carried on under field conditions are said to have shown that inoculated sulphur gave better control of potato scab than a like amount of uninoculated sulphur. Greenhouse experiments are reported which indicated that the principal benefit to be derived from the use of inoculated sulphur is due to the early oxidation of the sulphur.

Some experiments were conducted to determine whether the increased amount of inoculant would result in an increased efficiency of the sulphur medium for the control of scab, in which an abundant supply of the oxidizing organism *Thiobacillus thiooxidans* was added to the sulphur. Increasing the amount of inoculant apparently had little influence on the efficiency of the sulphur treatment.

Broadcasting sulphur was found to give much better control of potato scab than mixing it with the fertilizer.

The relative vigor of tubers for seed purposes from sprayed and unsprayed plants, W. H. MARTIN (*New Jersey Stas. Rpt. 1922, p. 600*).—In order to determine the effect of keeping potato plants green until killed by frost, the author investigated the vigor of tubers from sprayed and unsprayed plants. While no definite conclusions are drawn, it appears that tubers from vines which have been held green by spraying until dug possess greater vigor than tubers from plants that have been killed by foliage diseases.

Potato spraying and dusting tests in 1921, W. H. MARTIN (*New Jersey Stas. Rpt. 1922, pp. 574–582*).—In a season characterized by conditions that limited the occurrence of fungus diseases but which resulted in severe attacks of sun scald and tipburn, cooperative experiments were carried on to test the value of Bordeaux mixture and several copper lime dusts when applied to commercial potato growing. Bordeaux mixture increased the total yield of potatoes over the check plats, and a late application increased the difference very materially. Dusts as a rule did not give results that are considered to warrant the recommendation of their extensive use.

Studies of sweet potato diseases, R. F. POOLE (*New Jersey Stas. Rpt. 1922, pp. 554–560*).—As a result of the author's investigations, it is claimed that from 300 to 400 lbs. of inoculated sulphur with an equal amount of kainit broadcasted and harrowed into the soil just before the ridges are made gave satisfactory control of ground rot. Better keeping qualities of sweet potatoes are reported where the crop was produced from land to which applications of sulphur had been made. For the control of scurf, encouraging results were obtained from soil treatment with sulphur at the rate of from 200 to 400 lbs. per acre. Seed selection has been found beneficial for the control of stem rot.

Investigations are briefly noted on the relation of hotbed management to stem rot and on sweet potato seed treatment and hotbed sterilization.

Recommendations for the control of wildfire (*Connecticut State Sta., Tobacco Substa. Bul. 4 (1924), pp. 3*).—Recommendations are given for the control of wildfire of tobacco in revision of those previously reported (E. S. R., 49, p. 647).

Tomato spraying and dusting experiments at Riverton, R. F. Poole (*New Jersey Stas. Rpt. 1922, pp. 561–565*).—A comparison was made of different strengths of Bordeaux mixture, Bordeaux mixture to which soap was added, and a dust composed of anhydrous copper sulphate and hydrated lime for the control of *Septoria lycopersici* on tomatoes. In nearly every instance the treated plats gave larger yields than the untreated ones, and the author claims that, while no conclusions should be drawn from the dust treatment, there is evidence that indicates good control can be obtained with dust provided a satisfactory adhesive mixture is added to the fungicide.

A new fruit rot of tomato, R. F. Poole (*New Jersey Stas. Rpt. 1922, p. 566*).—A brief account is given of a disease of tomatoes due to *Oidium lactis*. Previous description of this fruit rot has been given (E. S. R., 50, p. 551).

Spray vs. dust in controlling the diseases of apples, G. W. Fant (*New Jersey Stas. Rpt. 1922, pp. 551–553*).—Commercial lime sulphur and atomic sulphur applied as sprays and dusts were tested for the control of scab, black rot, and brown rot of apples. Satisfactory control was obtained with all the treatments, and, so far as the one season's work is concerned, it is believed that the use of either fungicide will control these diseases of the apple.

An apple stem-tumor not crowngall, N. A. Brown (*Jour. Agr. Research [U. S.], 27 (1924), No. 9, pp. 695–698, pls. 3*).—The author describes outgrowths observed on the stems of apple trees which have heretofore been generally believed due to infection by *Bacterium tumefaciens*, but from which the author was unable to gain any evidence that the trouble was due to the crowngall organism.

Spraying experiment for control of pear leaf and fruit spot, G. W. Fant (*New Jersey Stas. Rpt. 1922, pp. 548–551*).—A report is given of an experiment conducted to control the fruit and leaf spot of the pear due to *Fabraea maculata*. Trees were sprayed with self-boiled and commercial lime sulphur in varying strengths. From the data obtained it appeared that the best control was secured with seven applications of commercial lime sulphur. The date of appearance of the disease has an important bearing on the number of applications, and the author claims it is necessary to determine this date in order to solve the problem satisfactorily.

Bacterial disease of the Wragg cherry, W. G. Sackett (*Colorado Sta. Rpt. 1923, p. 17*).—The author reports this disease present in the Crowley district of Colorado to a greater degree than in 1922. It was also observed in other parts of the State, but the damage to the crop was practically negligible. The organism was again isolated from diseased cherries as in former years and inoculation experiments made on both leaves and fruit. Negative results were obtained in the attempt to inoculate the leaves, but spots were produced on the cherries themselves.

Spraying experiment for the control of the cherry leaf spot (Cylindrosporium padi Karst), W. D. Moore (*New Jersey Stas. Rpt. 1922, pp. 569–572, pls. 2*).—As a result of two years' experiments, it is concluded that three applications of lime sulphur 1:40 made at intervals of three weeks, beginning as soon as the fruit is picked, will give good commercial control of the cherry leaf spot.

The brown rot canker and twig blight of the peach, G. W. Fant (*New Jersey Stas. Rpt. 1922, pp. 547, 548*).—A brief account is given of studies of the brown rot canker and twig blight of peach due to *Sclerotinia cinerea*. It was found that the more common methods of inoculation of twigs and branches include blossom infection in the spring, with a subsequent growth of the fungus down through the pedicel into the twig; infection through the wounds of the host; and through contact of infected fruit with adjacent twigs. In studying the time and source of infection, spores of the brown rot fungus were found to remain viable throughout the winter, regardless of winter freezes, and were disseminated by rain, winds, etc., during the fall and winter. In addition, the fungus on old mummies renews growth a week or more in advance of the blooming period of the peach, which may result in abundant infection when the blossoms are in the pink stage.

Histological studies of the region in which the fungus growth occurs showed that the parasite is practically confined to the region just external to the cambium.

A new peach wilt disease, C. M. HAENSELER (*New Jersey Stas. Rpt. 1922, p. 568*).—A brief account is given of a wilt disease of peach which has been noted from another source (E. S. R., 50, p. 751).

Anthracnose of cane fruits and its control on black raspberries in Wisconsin, L. K. JONES (*Wisconsin Sta. Research Bul. 59 (1924), pp. 26, pls. 8, figs. 3*).—The anthracnose due to *Plectodiscella reneta* is said to be one of the most serious diseases of black raspberries and blackberries in Wisconsin. The disease is manifested by the occurrence of purplish to white spots on the canes, leaves, petioles, peduncles, and pedicels and in the drying up of the fruit. The disease is said to appear first on the young growing canes and leaves in early spring, usually when the canes are from 8 to 10 in. in height. The lesions continue to increase in number on the young growing tissue throughout the early summer, and as the plants cease growth during July resistance to the disease is developed.

The temperature and moisture relations of the fungus are reported upon at considerable length.

For the control of the disease the author recommends good cultural practices, such as the removal of weeds which increase humidity around the canes and in making new plantings the removal of all the old canes from the young roots, thus eliminating a source of inoculation. The anthracnose of black raspberries has been satisfactorily controlled by spraying with lime sulphur or Bordeaux mixture, lime sulphur giving somewhat the better results. A single application made about a week before blooming failed to reduce the disease, but sprayings after blooming increased the effectiveness of the fungicides, although injury to the foliage was sufficient to preclude its extended use. For the control of the disease under Wisconsin conditions, the author recommends spraying with a strong lime-sulphur solution after a few leaves unfold in the spring and the same in dilute solution about a week before the blooming period of the plants.

Facts regarding the mosaic disease of raspberry and loganberry in western Washington, A. FRANK (*Western Washington Sta. Bimo. Bul., 12 (1924), No. 2, pp. 48–51, figs. 3*).—The author reports the presence in western Washington of a degeneration disease of raspberries, loganberries, and some types of blackberries. The disease infection is described, and for control it is recommended that only healthy stock be planted, diseased plants rogued out as soon as they appear, and insects which may act as carriers of the infection controlled.

Raspberry mosaic and curl, B. T. DICKSON (*Sci. Agr., 3 (1923), No. 9, pp. 308–310*).—Definite mosaic and leaf curl have been present in Canada for many years. The author has previously presented evidence regarding the existence of two distinct diseases (E. S. R., 48, p. 242), and Rankin is credited with a similar conclusion (E. S. R., 48, p. 449).

Owing to the use of the general term "yellows," it is now considered advisable to confine the terminology to mosaic and leaf curl, for the present at any rate. The symptoms of both diseases as noted in Quebec are described.

All indications at present point to *Aphis rubiphila* as the agent in the spread of raspberry mosaic, and the same organism is said to be shown conclusively by the work of Rankin in Ontario to be the infecting agent in leaf curl.

"If mosaic or curl, or both, are present in the plantation to such an extent that eradication by roguing is inadvisable, it is necessary to start a new plantation at a distance from the old. . . . If it is impossible to start a new plantation, rogue diseased plants, remove them at once, and burn at a distance. Digging and removal should be carefully done so that aphids are not shaken off or brushed off during the process. As a result of work in Ontario it appears that early eradication is commercially successful. Symptoms appear as soon as leaves develop, and plants should be removed when the disease is evident."

The ecological life history of certain species of Ribes and its application to the control of the white pine blister rust, W. S. Cooper (*Ecology, 3 (1922), No. 1, pp. 7–16, figs. 3*).—This study is a portion of the outcome of one season's field work upon the ecology of the gooseberries and currants in New England and the Adirondacks, undertaken for the white pine blister rust control work of the U. S. D. A. Bureau of Plant Industry.

"The study shows that no plant community may be consistently and safely disregarded in the search for Ribes. The only possibility is the beech-maple-hemlock climax, and this is so limited in extent in the region where eradication is likely to be practiced that its immunity, even if true, is of little practical significance. The great mass of the country is either favorable for Ribes introduction at the present time or may support Ribes holding over from former conditions.

"It seems possible to prophesy with reasonable certainty whether a given tract, once made free of Ribes, will remain so indefinitely, or will have to be watched carefully from year to year. In general, closed forest, once thoroughly cleaned of gooseberries, can be safely disregarded in the future, since there are no effective agencies that will renew the species from without. Any individuals that do become established will develop a minimum of infection and of fruit in such places. Open pastures, old orchards, thickets, and similar places must be carefully watched for new arrivals, since the agents of dissemination are continually active therein, and infection is likely to be heavy. Thorough care of such critical places will also operate to prevent accidental introduction of seed into near-by closed forest."

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A manual of land and fresh water vertebrate animals of the United States (exclusive of birds), H. S. Pratt (*Philadelphia: P. Blakiston's Son & Co., 1923, pp. XV+422, pl. 1, figs. 184; rev. in Science, 59 (1924), No. 1531, pp. 400, 401*).—This manual includes a bibliography of six pages, a list of authors, and a glossary of technical words and terms.

List of North American recent mammals, 1923, G. S. Miller, jr. (*U. S. Natl. Mus. Bul. 128 (1924), pp. XVI+673*).—The author here recognizes 2,554 forms, of which all but 171 are represented in the U. S. National Museum, 1,344 being eutypes and 91 hypotypes. A guide to type localities, prepared by A. J. Poole, is appended (pp. 517–603).

Animal life in the Yosemite, J. Grinnell and T. I. Storer (*Berkeley: Calif. Univ., 1924, pp. XVIII+752, pls. 14, figs. 197*).—An account of the mammals, birds, reptiles, and amphibians in a cross section of the Sierra Nevada.

Handbook of zoological dissections, A. Bonnet (*Précis-Atlas de Dissections de Zoologie. Paris: Libr. Octave Doin, 1924, pp. 416, figs. 395*).—This handbook presents information on work with the various orders of animals.

A synopsis of the Accipitres (diurnal birds of prey), H. K. Swann (*London: Wheldon & Wesley, Ltd., 1921–1922, 2. ed., rev., pts. 1–4, pp. VIII+233*).—The several parts of this work deal with the species and subspecies described up to 1920, their characters and distribution, as follows: (1) Vultur to Accipiter, (2) Erythrotriorchis to Lophoaëtus, (3) Herpetotheres to Pernis, and (4) Microhierax to Pandion. The first two parts of the earlier edition have been noted (E. S. R., 43, p. 250).

Song birds, Count Delamarre de Monchaux (*Les Oiseaux Chanteurs. Paris: Paul Lechevalier, 1923, pp. LXV+107, pls. 96, figs. 174*).—This is a small handbook of the principal European species of song birds, accompanied by colored plates of the forms considered.

Local suppression of agricultural pests by birds, W. L. McAtee (*Smithsn. Inst. Ann. Rpt., 1920, pp. 411–438, pls. 3*).—Data are presented which show the extent of insect control by birds. A list of the insect pests and the birds mentioned as destroying them is included.

The author concludes that, while birds may exercise a noticeable degree of control of injurious insects over an extensive range, actual suppression is accomplished usually only in very limited areas. Instances of local suppression of pests by birds are said to be sufficiently numerous to have attracted the attention of many observers. Omitting references to vertebrate and plant nuisances, the instances cited relate to 32 insect pests, most of which are exceedingly injurious. In more than 70 instances birds apparently exterminated one or more of them locally; or at least so reduced them that no further damage ensued.

Report of the department of biology [New Jersey Stations], G. W. Martin et al. (*New Jersey Stas. Rpt. 1922, pp. 317–343, pls. 4, figs. 3*).—Continuing previous work (E. S. R., 48, p. 374), a preliminary report on the food of the oyster (pp. 317–320), first presented, includes an account of the examination of the stomach contents, feeding experiments, and studies on shell growths. The report of the biologist, T. C. Nelson, includes accounts of further investigations of the feeding habits of oysters, seasonal variations in the plankton and in the food of the oyster, further investigations of the distribution and the behavior of oyster larvae, observations on setting, investigations of the oyster drills, Urosalpinx and Dupleura, scallops in Barnegat Bay, and observations on marine borers in Barnegat Bay.

A sporadic outbreak of the brackish water pileworm (*Teredo navalis*) associated with the marine shipworm *Bankia gouldi* resulted in the destruction of untreated piling in Barnegat Bay.

A new mite from the lung sac of a rattlesnake, H. E. Ewing (*Ent. Soc. Wash. Proc., 26 (1924), No. 6, p. 179*).—Under the name *Entonyssus rileyi* n. sp., the author describes a dermanyssid mite taken from the lung sac of a rattlesnake from Texas.

Tularaemia.—XI, Tularaemia infection in ticks of the species Dermacentor andersoni Stiles in the Bitterroot Valley, Mont., R. R. Parker, R. R. Spencer, and E. Francis (*Pub. Health Rpts. [U. S.], 39 (1924), No. 19, pp. 1057–1073*).—This is a continuation of the series of papers previously noted (E. S. R., 49, p. 784). The occurrence of tularaemia in the Bitterroot Valley in western Montana has been demonstrated by the recovery of *Bacterium tularense* from ticks of the species *D. venustus* (*andersoni*) collected in nature. The larvae of this tick were infected with *B. tularense* by permitting them to engorge on infected guinea pigs. Snowshoe rabbits and woodchucks have been shown to be susceptible to tularaemia, and they are also important hosts of this tick.

Report of the department of entomology [New Jersey Stations], T. J. HEADLEE ET AL. (*New Jersey Stas. Rpt. 1922, pp. 411–475, pls. 8*).—This report deals with insects of the year; climate and insect investigations; investigations of orchard insects, including the codling moth, pear psylla, and orchard plant lice; investigations of dusts, stickers, spreaders, and dilutents; A Study of Dust Carriers for Nicotine, by W. Rudolfs (pp. 445–449); Investigations of Cranberry Problems, by C. S. Beckwith (pp. 449–465); Response of Germinating Corn and White Grubs to Paradichlorobenzene and Similar Chemicals, by G. W. Fant, W. D. Moore, and A. Peterson (pp. 465–473), noted on page 631; and investigations of the biology of sewage disposal.

The investigations, details of which are presented in tabular form, have shown that Milltown ball clay No. 9 dried and ground to 200 mesh, when mixed 1 part by weight with 10 parts of beans, wheat, or shelled corn, prevents the infestation of the beans by the common bean weevil and the infestation of the wheat and shelled corn by the Angoumois grain moth (E. S. R., 51, p. 358). Tests of the effect of different temperatures upon the infestation of hickory billets by one of the powder post beetles (*Lyctus* sp.) indicate that an exposure of the billets for two hours after they have reached 130° F. will kill the larvae of this beetle. Codling moth control work at Glassboro under conditions such as to bring about an infestation of 100 per cent of all the apples borne on unsprayed trees are briefly reported upon, the details being presented in tabular form. The maintenance of a coating during the period of both broods resulted in an increase of 26 per cent of sound fruit above that which was obtained by the application of the regular schedule. Pear psylla control work is briefly reported upon. Work with orchard plant lice seems to have demonstrated that neither Keresol nor Sulco V. B. gives as complete a kill of the rosy and the green aphids as does the winter strength commercial lime sulphur to which 40 per cent nicotin has been added at the rate of 1 to 500.

Investigations of nicotin dusts have led to the following conclusions: "Nicotin dusts composed of Milltown ball clay No. 9 and ground burned lime as a carrier, when applied at the rate of 50 lbs. per acre under summer temperatures and atmospheric moistures and allowed 48 hours without rain, will kill a slightly higher percentage of the pink and green aphids of the potato and tomato (*Macrosiphum solanifolii*) than can be destroyed with the regular nicotin soap and water plant-louse spray. The kill effected by the said nicotin dusts occurs much more slowly than the kill effected by the standard nicotin, soap, and water spray. While the increase in nicotin content increased not only the kill but the speed thereof, it became expensive, out of proportion to the additional percentages of lice destroyed. The occurrence of rain within the 48-hour period following the application of nicotin dust greatly interfered with the activity of the dust. The kill effected by the nicotin dust probably occurred to a considerable extent, at least, through the medium of the gas evolved from the dust." See also a previous note (E. S. R., 50, p. 254).

Studies of a number of dust carriers were made, by Rudolfs, with the view to improving nicotin delivery, the details of which are presented in tabular form. It was found that dolomite, consisting of approximately 98 per cent calcium and magnesium carbonates, gave a superior nicotin evolution as compared with the commercial and other mixtures. Sea sand, a poorer absorbent than dolomite, releases more nicotin with a dry stream of air than dolomite, but is not so well adapted for dusting because it is so heavy. It is pointed out that dolomite is cheap and easy to purchase, convenient to handle, not difficult to grind, does not burn the plants, has an adhering quality not usually found in other carriers, and can be used with both nicotin sulphate and free nicotin mixtures. For these reasons the author states that a better carrier could not be found.

In the report of cranberry investigations, data on grasshopper injury to the crop, by H. B. Scammell, are included. Eggs were found deposited by a long-horned species in the crown of "deer grass" (*Panicum dichotomum*) close to the ground, between the withered leaf and the stem. June flooding can not be relied upon to keep the bog clear for the balance of the season. Air-slaked lime treatment may suffice to drive hoppers from a bog under certain conditions, but it gave no relief in the instances related. The use of Paris green bran mash flavored with lemons against the grasshoppers on bogs failed to give satisfactory results. The fall flooding of several bogs led to the conclusion that this treatment may be a valuable aid in clearing the long-horned species from the bog if it is applied early or, at least, as soon as the picking of the crop is completed. The principal long-horned forms studied on cranberry bogs are *Orchelimum concinnum* Scudd. and *O. glaberrimum* Burm., and the short-horned forms are *Schistocerca alutacea* Harr. and *Melanoplus femoratus* Burm.

The measures recommended by Scammell (E. S. R., 38, p. 59) for control of the cranberry girdler are said to have given excellent results. The investigations indicate that this pest may be best controlled by flooding for a few days in early August.

"Insectae Portoricensis," G. N. Wolcott (*Jour. Dept. Agr. Porto Rico, 7 (1923), No. 1, pp. 313, figs. 11*).—This is a preliminary annotated check list of insects of Porto Rico, which includes descriptions of new species. A bibliography of the general and economic papers on Porto Rican insects is given (pp. 10–16).

Notes on Queensland cane-insects and their control, E. Jarvis (*Queensland Bur. Sugar Expt. Stas., Div. Ent. Bul. 17 (1923), pp. [3]+99, figs. 35*).—This is a compilation prepared by the author from his monthly and other notes previously published.

Melon and cucumber insects, C. J. Drake and F. A. Fenton (*Iowa Sta. Circ. 90 (1924), pp. 8, figs. 11*).—This consists of brief accounts of the melon aphid, squash bug, squash borer, striped cucumber beetle, etc. Directions for the preparation of nicotin dust and for making a dust mixer are included.

Why, when, and how to fumigate (*Calif. Cult., 62 (1924), No. 23, pp. 643, 663, fig 1*).—This account includes an illustration of an autofumer mounted on a Ford chassis, which, in addition to providing power for transportation, is supplied with a specially arranged heating device and a pump for supplying the necessary pressure for atomizing gas under the tents.

Cyanogen chloride gas mixture (*Pub. Health Rpts. [U. S.], 39 (1924), No. 11, p. 529*).—Mention is made of the use of a new fumigant known as cyanogen chlorid gas mixture, which combines the lethal qualities of hydrocyanic acid gas with the lachrymatory properties of "tear" gas, and is safer to use due to the warning given of the presence of poisonous gas.

Damage by termites in the Canal Zone and Panama and how to prevent it, T. E. Snyder and J. Zetek (*U. S. Dept. Agr. Bul. 1232 (1924), pp. 26, pls. 10, fig. 1*).—In this bulletin the authors give original data on the habits of termites in the Canal Zone and Panama, the damage they do, and means of control, additional to that given in the preliminary paper by Dietz and Snyder (E. S. R., 50, p. 659). Maps showing the Panama Canal and the humid division of the lower tropical zone are attached.

Tests of methods of protecting woods against termites or white ants.—A progress report, T. E. Snyder (*U. S. Dept. Agr. Bul. 1231 (1924), pp. 16, pls. 2, figs. 3*).—Tests made of protective measures against termites, the details of which are presented in part in tabular form, show coal tar creosote to be the most effective preservative. Impregnation by the open-tank method with this preservative renders wood resistant to attacks by termites for at least 15 years. Impregnation by the full-cell process renders wood resistant for at least 25 years, and this method is recommended for wood to be exported for use in tropical countries. Brushing several coats of coal tar creosote on timber will add from 2 to 5 years to its life, and pigments may be added to the oil to give the wood a painted appearance. For interior woodwork, furniture, cabinet woods, etc., impregnation with zinc chlorid, bichlorid of mercury, sodium fluorid, or chlorinated naphthalene is effective, and the woods can be painted after such treatments. Another protective method is to treat the hidden, cheaper cores of furniture, cabinet woods, etc., with preservatives during manufacture and then overlay them with veneers of termite-resistant woods. Effective poisons to be added to wood pulp products during manufacture are crude carbolic acid and coal tar creosote.

A new aphid attacking citrus (*Fla. State Plant Bd. Quart. Bul., 8 (1924), No. 3, pp. 93, 94*).—This is a portion of the report prepared by a special committee appointed by the Florida State Horticultural Society at its meeting in April.

The new citrus aphid, J. R. Watson (*Fla. Grower, 29 (1924), No. 20, p. 5*).—A new species of Aphis, distinct from the melon aphid, is said to have appeared from April 21 to May 3 throughout the southern part of the citrus belt as far north as Lake County in the central part of Florida and Brevard County on the east coast. It has been a source of serious injury to the orange, the greatest damage having occurred in Pinellas, Hillsborough, and Polk Counties.

The new aphis controlled by gas, R. W. Kelly (*Fla. Grower, 29 (1924), No. 23, pp. 5, 16, figs. 2*).—The use of calcium cyanid against the new aphid enemy of the orange in Florida is recommended.

Control of aphids on citrus (*Citrus Indus., 5 (1924), No. 5, p. 22*).—In this account, which is Florida Experiment Station Press Bulletin 357, the application of 3 per cent nicotin sulphate lime dust to both sides of the tree is recommended. Where dusting apparatus is not available, the application of 40 per cent nicotin sulphate at the rate of 1 part to 800 of water, with some spreader, is recommended.

A preliminary report on the intracellular symbionts of South African Coccidae, C. K. Brain (*Ann. Univ. Stellenbosch, 1 (1923), A, No. 2, pp. 48, figs. 66*).—Following a general consideration of the subject, the author gives an account of methods and technique and a review of the literature dealing with the symbionts of insects, arranged in chronological sequence. A provisional arrangement of the intracellular symbionts of insects, with a short record of every known species, is then presented (pp. 17–30). A bibliography of 40 titles is included.

A systematic monograph of the Tachardiinae or lac insects (Coccidae), J. C. Chamberlin (*Bul. Ent. Research, 14 (1923), No. 2, pp. 147–212, pls. 11, figs. 8*).—In this contribution from Stanford University, the author erects the new genus Austrotachardia and describes 10 forms as new to science.

Control of the San José scale in the Ozarks, A. J. Ackerman (*Ohio State Hort. Soc. Proc. 56 (1923), pp. 68–71*).—This is an account of the control resulting from the application of lubricating-oil emulsions in Arkansas, a previous account of which, by the author, has been noted (E. S. R., 49, p. 354).

The resplendent shield-bearer and the ribbed-cocoon-maker: Two insect inhabitants of the orchard, R. E. Snodgrass (*Smithsn. Inst. Ann. Rpt., 1920, pp. 485–509, pls. 3, figs. 15*).—This is a popular account of observations and studies made of *Coptodisca splendoriferella* and *Bucculatrix pomifoliella*. In southern New England and in New York the former has two generations each season. The second brood of moths, appearing during August, lays eggs which produce the second or late summer brood of caterpillars, which perforate the leaves in the fall. Most of the cases of *C. splendoriferella* examined in the spring were found to be parasitized by *Cirrospilus flavicinctus* Ril., and the summer cases were found infested by *Closterocerus tricinctus*. Colored plates illustrating the life stages and work of the two pests are included.

Apple and thorn skeletonizer, Hemerophila pariana Clerck, E. P. Felt (*N. Y. Agr. Col. (Cornell) Ext. Bul. 27 (1918), pp. 141–147, pls. 2, figs. 6*).—This is a summary of information on *H. pariana*, accounts of which have been previously noted (E. S. R., 40, p. 648; 41, p. 160).

The apple and thorn skeletonizer and its control, Hemerophila pariana Clerck, E. P. Felt and M. D. Leonard (*N. Y. Agr. Col. (Cornell) Ext. Bul. 86 (1924), pp. 7, pls. 2, figs. 6*).—A revision of the account above noted.

Gypsy moth, E. R. Ackerman (*Cong. Rec., 65 (1924), No. 106, p. 6996*).—This is a summary of information emphasizing the need for establishing a barrier zone against the westward spread of the gipsy moth.

A new moth injurious to cocoanut palm (Lepidoptera: Limacodidae), W. Schaus (*Ent. Soc. Wash. Proc., 26 (1924), No. 6, p. 180*).—Under the name *Natada urichia* the author describes a new limacodid lepidopteran from Trinidad, British West Indies.

Statistics of pink bollworm occurrence from 1916 to 1922 (*Egypt Min. Agr. Tech. and Sci. Serv. Bul. 27 (1923), pp. 19*).—Statistical data, here presented in tabular form and based upon summer collections during the past seven years, give the distribution of the pink bollworm in time and place in Egypt.

Nearctic Calliphoridae, Luciliini (Diptera), R. C. Shannon (*Insecutor Inscitiae Menstruus, 12 (1924), No. 4–6, pp. 67–81*).—In this paper the author presents tables for the separation of males and females of Luciliini. The genus Francilia is erected for a new species from Alaska, and eight species of Lucilia (green bottle flies) are recognized, of which two are described as new.

Cabbage maggot control, C. H. Nissley (*New Jersey Stas. Rpt. 1922, pp. 272, 273*).—In control work with the cabbage maggot, the corrosive sublimate treatment in all cases gave the best results, tar paper disks the second best, and tar and sand third. Corrosive sublimate was applied at a cost per acre of $14.62 for each of two applications. The cost and placing of tar paper disks to the number of 11,616 per acre amounted to $39, and the cost for tar and sand per acre $11.15 for each of two applications.

The ox warble fly (heel fly), J. W. Kalkus (*Western Washington Sta. Bimo. Bul. 12 (1924), No. 2, pp. 30–33*).—This is a brief summary of information on the ox warble, the nature of its damage, and means of prevention and control. This pest is said to be found all over the State of Washington, being particularly abundant west of the Cascades.

Cold storage as a control of fruit fly, W. B. Gurney (*Agr. Gaz. N. S. Wales, 34 (1923), No. 7, p. 528; abs. in Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 1, p. 236*).—Cold storage experiments with fruits infested with fruit fly are said to indicate clearly that after 20 days' storage at 34° F. the fruit is in good condition and finds a ready sale. In 10 small lots of fruit, including oranges, apples, peaches, nectarines, and pears, thus treated, apparently all larvae were killed.

Report of mosquito work, T. J. Headlee and W. M. Walden (*New Jersey Stas. Rpt. 1922, pp. 475–486*).—In the report of mosquito work, reference is made to investigations of the attractiveness for *Aedes sollicitans* and *A. cantator* of substances given off by the human body, previously noted by Rudolfs (E. S. R., 47, p. 553), in which it was found that carbon dioxid and ammonia, which are the ultimate decomposition products of all the excretions and secretions of the human body, are particularly attractive to mosquitoes, inducing them to span distances and to attempt to stab. The drainage of salt marshes; plans, surveys, and inspections; and county work are considered at some length (pp. 476–485). Some 7,000 acres of hitherto undrained marshes were ditched during the year.

Otiorrhynchus raucus Fab., an insect enemy of rhubarb in France [trans. title], A. Hoffmann (*Bul. Soc. Ent. France, No. 18 (1923), pp. 233, 234; abs. in Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 2 (1924), No. 1, p. 237*).—Serious injury was caused by *O. raucus* to rhubarb in the Department of Seine-et-Oise through the devouring and soiling of young leaves by the adult and the attack of the roots by the larvae.

The palm beetles in Burma, with notes on other palm pests, C. C. Ghosh (*Burma Dept. Agr. Bul. 19 (1923), pp. 38, pls. 9*).—This is a summary of information on *Oryctes rhinoceros* L., *Xylotrupes gideon* L., *Rhynchophorus ferrugineus* Oliv., and *Nephantis serinopa* Meyr., and means for their control in Burma.

In an appendix the author reports that a Penicillium-like fungus, which appeared and killed an entire lot of Xylotrupes grubs in the laboratory at Mandalay, was tried and also killed a lot of 300 Oryctes grubs. The investigations have led to the conclusion, however, that this fungus cannot be relied upon in combating grubs of either genus.

[Boll weevil control], W. E. Hinds (*La. Agr. Col. Ext. Circs. 71 (1924), pp. 4, fig. 1; 72, pp. 4, fig. 1; 73, pp. 4, fig. 1*).—These circulars deal, respectively, with Boll Weevil Control for Louisiana, 1924; Killing Over-Wintered Weevils. "The Pre-square Poisoning"; and Machines and Poison for Weevil Control.

Summary of United States Bureau of Entomology 1923 field tests comparing certain suggestions for weevil control (*Cong. Rec., 65 (1924), No. 108, p. 7137*).—In tests of methods of boll weevil control during 1923, here presented by J. P. Buchanan in tabular form, it was found that with the dusted calcium arsenate method there was a profit of $18.05 per acre, for the home-made molasses mixture method $5.47, and for the Florida method 78 cts. With Hill's mixture, Weevilnip, and Boll-we-go there were losses of $10.98, $5, and $2.55, respectively.

Buff-coloured tomato weevil (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 3, p. 265*).—The discovery of *Listroderes nociva* Lea at Port Elizabeth in August, 1921, is recorded by the Eastern Province entomologist.

Descriptions of new Hymenoptera in the Canadian national collection, Ottawa, H. L. Viereck (*Canad. Ent., 56 (1924), No. 5, pp. 110–112*).—The genus Ceratophygadeuon is erected and four species are described as new. *Telenomus alsophilae* n. sp. is said to parasitize the eggs of the fall cankerworm at Kentville, N. S.

The occurrence of an important European parasite in North America (Hymen.: Elachertidae), D. S. Lacroix (*Ent. News, 35 (1924), No. 6, p. 211*).—In the course of studies of the spotted cutworm *Agrotis c-nigrum* L. on the cranberry in Massachusetts, the parasite *Euplectrus bicolor* Sw. was encountered. This is said to be the first record of the occurrence in North America of this important parasite of cutworms from France and Italy.

Acarine disease explained, J. Rennie (*North of Scot. Col. Agr. Mem. 6 [1923], pp. 50*).—This is a revision of the author's notes on acarine disease published during the years 1921–1922 (E. S. R., 47, p. 558). Following an introductory account, the several parts deal with the progress of infestation, factors affecting the course of the disease within a colony, the symptoms of acarine disease, profitable diseased stocks and their problems, diagnosis and grading of acarine infestation, dissection routine for acarine infestation, and hopes of deliverance.

Control of American foul brood, D. H. Jones (*Sci. Agr., 4 (1924), No. 10, pp. 322–324, figs. 3*).—The author finds that a 15 per cent solution of formalin will destroy the spores of *Bacillus larvae* as they occur in larval scales in open cells in 24 hours.

FOODS—HUMAN NUTRITION.

Weight-height-age tables (*Mother and Child, 4 (1923), No. 7, Sup., pp. [11]*).—Two tables for use in determining malnutrition are presented.

Tables for boys and girls of school age, B. T. Baldwin and T. D. Wood.—The data included in these tables are drawn from the records of 74,000 boys and 55,000 girls, from which have been selected 24,000 measurements for boys and 12,012 for girls who are presumably healthy and upon whom from 5 to 14 consecutive measurements have been taken at approximately yearly intervals under standard conditions. Over 95 per cent of the children included are American born. To these figures have been added estimated weights of children shorter and taller than those actually measured.

To show the difference in the growth of tall, medium, and short children, the middle 75 per cent of all the children within each age group for height are classified as of medium height, and the 12.5 per cent above and below this group as tall and short, respectively. This classification shows that tall children have growth acceleration at adolescence earlier than medium children and the latter earlier than short children.

In commenting on these tables, the authors state that "the limitations of all growth tables should be recognized. They do not aim to present a complete clinical picture of a child's physical condition. However, the relation of weight to height and age is the best single index of general health and nutrition, as well as the best criterion of normal growth, that we possess. Thorough examinations of children from the standpoint of growth, nutrition, and disease should be made before any arbitrary limitations can be fixed for underweight or overweight."

Tables for infancy and early childhood, R. M. Woodbury.—These tables of average weights for height of boys and girls from birth up to 6 years of age are based on data from record cards obtained by the Children's Bureau, U. S. Department of Labor, for over 2,000,000 children from all parts of the country. From these, 167,024 cards for white children were selected as the basis for these tables. The children included were 70 per cent of native parentage.

The new Baldwin-Wood weight-height-age tables as an index of nutrition, T. Clark, E. Sydenstricker, and S. D. Collins (*Pub. Health Rpts. [U. S.], 39 (1924), No. 11, pp. 518–525*).—A previously reported study (E. S. R., 50, p. 460) has been extended by applying the new Baldwin-Wood tables noted above to the same group of children and comparing the results with those obtained by the Wood table.

According to the new standard only 16 per cent of the 506 children examined were more than 10 per cent underweight as compared with 20 per cent by the Wood tables. Of the 102 children who were underweight according to the

Wood standard, 80 were underweight according to the new Baldwin-Wood standard, and the other 22 were within the 10 per cent limit, although below the average. The two tables seem to differ more for the boys than for the girls.

A comparison of the metabolism of some mineral constituents of cow's milk and of breast milk in the same infant, C. C. Wang, D. B. Witt, and A. R. Felcher (*Amer. Jour. Diseases Children, 27 (1924), No. 4, pp. 352–368*).—In order to compare the utilization of the calcium of breast milk and cow's milk, five male infants between the ages of 11 days and 6 months were fed alternately on breast milk and cow's milk modified to approximate the breast milk requirement for the age of the child. A period of 6 days was used for each diet, but analyses were made only on samples obtained during the last 3 days. The determinations included calcium, magnesium, phosphorus, and chlorin of both urine and feces. The change from one milk to the other was made gradually to avoid gastrointestinal disturbances.

The results obtained on different days on the same diet varied quite considerably, owing, it is thought, to the failure to evacuate the bowels completely every 24 hours. The average values of at least 3 days are thought to be sufficiently accurate. A change from breast milk to cow's milk was invariably accompanied by an increase in the quantity of calcium excreted in the feces, but by only slight and inconsistent changes in its excretion in the urine. The actual quantity of calcium absorbed and retained was greater for cow's milk than for breast milk, but the percentage utilization and retention was greater for breast milk except in the case of the older children. The average percentage utilization of cow's milk was 47.5 and of breast milk 63 per cent. Corresponding figures for retention were 46.1 and 60.9 per cent.

The calcium metabolism of breast milk did not appear to vary with the age of the child, but that of cow's milk increased with the age.

Studies on the acidity (H-ion concentration) of infants' stools, F. F. Tisdall and A. Brown (*Amer. Jour. Diseases Children, 27 (1924), No. 4, pp. 312–331, figs. 10*).—Over 1,300 determinations of the H-ion concentration of infants' stools were made by the colorimetric method, using a dialysate of the stools as the test solution.

The pH values of the stools of normal, newly born, breast-fed infants were found to be remarkably constant, varying from 4.7 to 5.1, while the values obtained on the stools of artificially fed infants varied from pH 4.6 to slightly higher than pH 8. The lowest pH values were obtained in severe diarrheal conditions. Infants fed on butter soup generally had stools with an acidity of about pH 6, and those fed on protein milk, cow's milk dilutions with added carbohydrates, and whole soured milk with added carbohydrates generally had stools more alkaline than pH 7. No difference in acidity was noted depending upon the form of carbohydrate added. The acidity of the stools was generally increased by the presence of parenteral infection.

In discussing the factors influencing the acidity of the stools, the conclusion is drawn that "from the chemical standpoint the acidity apparently depends on the ratio, in the intestinal zone of fermentation, of the carbohydrate on one hand to the protein and base on the other. The amount of carbohydrate in the zone of fermentation apparently is influenced by the extent of the zone of fermentation, by the type of carbohydrate, and by the state of health of the intestinal cells."

Hair ball formation in rats in relation to food consistency, H. S. Mitchell, P. J. Bradshaw, and E. R. Carlson (*Amer. Jour. Physiol., 68 (1924), No. 2, pp. 203–206*).—The authors have observed that 90 per cent of their laboratory rats fed on paste foods containing from 25 to 27 per cent of fat developed hair balls in the pyloric end of the stomach, while out of 135 rats on dry foods and 13 on liquid foods none developed hair balls. This phenomenon is attributed to the high fat content and sticky consistency of the food. The condition has not been found to interfere with normal growth, but through constant irritation has been found to cause inflammation and ulceration of the gastric mucosa, with resulting weakened condition in adult rats. A reduction in the fat content of the basal diet has proved beneficial.

Creatinine and creatine in muscle extracts.—V, A comparison of the rate of creatinine formation from creatine in extracts of brain and muscle tissue, F. S. HAMMETT (*Jour. Biol. Chem., 59 (1924), No. 2, pp. 347–351*).—Using methods employed in a previous paper of the series (E. S. R., 48, p. 361), determinations were made of the preformed and total creatinin in fresh and incubated extracts of the brain and muscle tissues of rats, and of the rate of transformation of creatin to creatinin in these tissues. The results obtained show that creatin is transformed to creatinin at practically the same rate in extracts of brain tissue as in extracts of muscle tissue of the same animal. This supports the theory of Folin and Denis (E. S. R., 31, p. 661) that creatinin formation is an index of the total normal tissue metabolism.

The nutritive value of lactalbumin, T. B. OSBORNE, L. B. MENDEL, and H. C. CANNON (*Jour. Biol. Chem., 59 (1924), No. 2, pp. 339–345, fig. 1*).—Experimental data are reported, confirming the conclusion previously drawn (E. S. R., 33, p. 262), that lactalbumin is "a protein of good quality, judged by its capacity to satisfy the needs of growing rats." The validity of this conclusion has been denied by McCollum, who has stated that "lactalbumin as the sole source of protein can not support any growth whatever [E. S. R., 47, p. 363]." The statement has also been made by Sure that lactalbumin is biologically an incomplete protein (E. S. R., 44, p. 462). Since the food intake in the experiments upon which the conclusions of McCollum and Sure were drawn was not recorded, the possibility is suggested in the present paper that the apparent failure of lactalbumin might be due to an insufficiency of vitamin B.

In the present study, the objection to the use of protein-free milk as the source of vitamin B was overcome by using the yeast fraction of Osborne and Wakeman. Two diets were used consisting of lactalbumin 9 and 20 and starch 63 and 52 per cent, respectively, with the other ingredients salt mixture 4, lard 12, butterfat 9, and cod liver oil 3 per cent. The vitamin preparation was fed apart from the basal ration in daily doses of 40 mg. The growth curves reported showed rapid gains even on the food mixture furnishing only 9 per cent of lactalbumin.

In commenting further on McCollum's criticism of previous work on the ground that the protein-free milk might furnish sufficient protein nitrogen to make up for deficiencies in the amino acids of the proteins tested, it is maintained that protein-free milk, when fed even to the extent of 28 per cent of the diet, does not furnish enough of either trytophan or lysin to affect the experiments in which a deficiency of the protein in these two amino acids has been demonstrated.

Cystine deficiency and vitamin content of the lentil, Lens esculenta Moench, D. B. JONES and J. C. MURPHY (*Jour. Biol. Chem., 59 (1924), No. 2, pp. 243–253, figs. 5*).—The authors, with the assistance of O. Moeller, have investigated by the methods employed in previous studies (E. S. R., 48, p. 67) the nutritive value of the lentil, *L. esculenta*, with respect to proteins and vitamins A and B.

As was the case with other legumes tested, the proteins of the lentil were found to be somewhat deficient in cystin. Rats fed a diet containing 66 per cent of raw lentils lost weight rapidly and died in about 33 days, but when 36 per cent of cystin was added to the same diet fairly good growth resulted. Somewhat better results were obtained with cooked than with raw lentils.

About 2 gm. daily of the lentils was required to furnish sufficient vitamin B, and about 2.5 gm. sufficient vitamin A, for normal growth. In discussing the vitamin tests, the importance is emphasized of keeping a record of the food intake of each rat. If the substance to be tested is fed as a certain percentage of the diet and the food intake is not known, it is impossible to determine the actual consumption of the vitamin-containing food.

Biological food tests.—VI, Further experiments upon the vitamin A and B content of citrus fruit products, A. F. Morgan and M. S. Chaney (*Amer. Jour. Physiol., 68* (*1924*), *No. 2, pp. 397–406, figs. 2*).—The studies reported in the first paper of the series (E. S. R., 50, p. 59) have been supplemented by similar studies of the vitamin A content of lemon and grapefruit juice, oil, and peel, and of the content of both vitamins A and B in several cooked orange peel confections. The diet and technique employed were the same as in the previous study, with the exception that curative methods alone were tested.

Grapefruit juice, both fresh and concentrated, did not cure xerophthalmia in doses as large as from 15 to 30 cc. daily, but death was delayed from 4 to 5 weeks longer in the case of the fresh than of the concentrated juice. No protection was afforded by pressed grapefruit peel oil, nor by the ether extract of grapefruit peel in doses of from 0.2 to 1 gm. daily.

With from 15 to 30 cc. of lemon juice loss in weight and death were delayed from 4 to 13 weeks in 3 out of 4 animals tested, and with from 0.2 to 1 gm. of the ether extract of the peel the eye condition was alleviated and slight gains in weight were made. The confections tested included commercial orange marmalade prepared from equal parts of orange and lemon, homemade marmalade in which 2 parts of orange and 1 part of lemon were used, and commercial and homemade crystallized orange peel. In the preparation of the marmalade a considerably higher temperature and longer time of cooking were used for the commercial than the homemade product, and the same was assumed to be the case with the crystallized peel. All of the products were tested in 3-gm. daily amounts.

In the tests for vitamin A, a slight gain in weight and improvement of eye symptoms resulted with the homemade product, but no improvement with the commercial. Similar differences were noted in the tests for vitamin B, although the products in all cases appeared to contain less vitamin B than A.

In commenting upon the results obtained, attention is called to the higher vitamin A content of the orange than of the lemon and grapefruit as illustrating the correlation between yellow pigmentation and concentration of vitamin A. While it is thought that the difference in value of the homemade as compared with the commercial products is due to the lower temperatures used, it is pointed out that since the concentration of orange was higher in the homemade than in the commercial marmalade, the difference may be partly due to the higher content of vitamin A in orange than in lemon.

The vitamin B content of some Philippine fruits and vegetables, E. M. Acuña (*Philippine Agr., 12* (*1923*), *No. 7, pp. 293–302, fig. 1*).—The banana, papaya, and cowpeas were tested for their content of vitamin B by means of feeding experiments conducted on rats, with a basal diet consisting of polished rice 69, purified casein 15, butterfat 10, salt mixture (McCollum and Davis) 4, and filter paper 2 per cent. The materials tested were weighed fresh and mixed with the basal ration just before feeding. Three pairs of rats were used for each substance tested. After preliminary tests in which varying amounts were used, the papaya was fed in 10, 20, and 40 gm. daily doses and the banana and cowpeas in 5, 10, and 20 gm. doses. The amounts required to promote normal growth were 20 gm. of papaya, 10 of banana, and 5 of boiled fresh cowpeas.

Food accessory factors (vitamins) in bacterial growth.—VIII, Relation of substances formed by Bacillus coli to the growth of yeast, R. C. Robertson (*Jour. Infect. Diseases, 34 (1924), No. 4, pp. 395–399*).—In this continuation of the studies previously noted (E. S. R., 49, p. 460), a synthetic medium was prepared by boiling for 3 minutes a mixture of asparagin 3.4, calcium chlorid 0.1, dextrose 20, magnesium sulphate 0.2, potassium phosphate (K_2HPO_4) 1, and sodium chlorid 5 gm., with sterile distilled water to 1 liter. The solution was then made up to the original volume with distilled water, the reaction adjusted to pH 7.4, and the medium tubed in 5 cc. quantities in thoroughly cleaned and sterilized tubes and autoclaved at 20 lbs. pressure for 30 minutes. The tubes were inoculated with pure strains of *B. coli* and yeast, alone and in combination with each other and with carrot and yeast extracts. On incubation, continued growth was obtained in all tubes except the one containing the synthetic medium and yeast alone.

It is concluded that *B. coli* has the power of synthesizing a substance or substances which are growth-promoting for yeast, and which are closely related to or identical with the food accessory substances found in yeast and carrot extracts.

The multiple nature of bios, E. I. Fulmer, W. W. Duecker, and V. E. Nelson (*Jour. Amer. Chem. Soc., 46 (1924), No. 3, pp. 723–726*).—The evidence upon which the authors base their belief that bios consists of more than one substance is essentially that on fractionating a water extract of alfalfa with ethyl alcohol of different concentrations four fractions are obtained which differ only slightly in nitrogen content, from 1.2 to 1.56 per cent, but which have wide variations in ash content (from 0 to 34.1 per cent) and in solubility.

On using the various fractions as a source of bios for yeast growth in a suitable synthetic medium, irregular results in stimulation of growth were obtained. On testing the optimum concentrations of the three most active fractions in various combinations, a combination of two of the fractions gave much greater stimulation than the optimum of either fraction alone. This is thought to indicate that the fractions were not identical, and that extracts containing bios must contain at least two different yeast growth stimulants.

Vitamins and the borderland between health and disease, W. Cramer (*Lancet [London], 1924, I, No. 13, pp. 633–640, figs. 3*).—This is a general discussion based largely upon the author's investigations, which have been noted from other sources (E. S. R., 50, p. 565).

Blood pressure in rats under deficient diets, F. M. Baldwin, H. B. Cook, and V. E. Nelson (*Amer. Jour. Physiol., 68 (1924), No. 2, pp. 379–384, figs. 3*).—The authors report the average maximum blood pressure determined on the abdominal aorta of 30 normal rats to be 84 mm. of mercury, of 19 rats on a diet deficient in vitamin A 75 mm., and of 16 rats on a diet deficient in vitamin B 34 mm. As typical illustrative cases, the blood pressure records of which are reproduced, are given a normal male rat 11 weeks old, weight 120 gm., body temperature 102° F., and maximum pressure 92 mm.; a male rat 11 weeks old (which had been on a deficient diet for 7 weeks), weight 47 gm., temperature 100.2°, and maximum pressure 70; and a female rat 9 weeks old (which had been on a deficient diet for 5 weeks), weight 70 gm., temperature 98°, and maximum pressure 40 mm.

It is noted that in normal and B-deficient animals, when the clamp from the artery is released, there is an immediate rise to the maximum value, while in the A-deficient animals the rise is gradual. It is suggested that one of the chief factors contributing to the marked differences in blood pressure of the different groups is the alteration of the heart muscles.

The metabolism of cod liver oil by diabetics, V. H. MOTTRAM (*Lancet [London], 1924, I, No. 12, pp. 593, 594, fig. 1*).—To determine whether unsaturated fatty acids undergo in the body a different kind of metabolism from saturated acids and may therefore be useful in diabetes, cod liver oil was substituted for butter in the diet of certain diabetics when they were receiving an egg and vegetable diet with 25 or 50 gm. of butter daily. Determinations were made of the total acetone bodies excreted before, during, and after the change from butter to cod liver oil. The mean excretion of acetone bodies during the cod liver oil period was 1.93 gm. per day and in the succeeding three days 1.72 gm. This is thought to indicate that the fat of the cod liver oil is metabolized along the same lines as those of butter.

An insulin-like material in various tissues of the normal and diabetic animal, C. H. BEST, R. G. SMITH, and D. A. SCOTT (*Amer. Jour. Physiol., 68 (1924), No. 2, pp. 161–182*).—This paper reports in detail the experimental proof of the conclusions reported in a preliminary contribution (E. S. R., 50, p. 260), that insulin is present in normal animals in various other tissues than the pancreas. Experiments are also reported showing that insulin is present in reduced amounts in the tissues of completely depancreatized dogs. Smaller amounts of insulin were obtained from the tissues of dogs subjected to ether anesthesia than from the tissues of normal or diabetic dogs.

In view of the presence of insulin in so many tissues, the authors are of the opinion that "insulin may prove to be a constituent of every cell in which carbohydrate is metabolized, and the islands of Langerhans to be specially developed structures which supply the active material when the demand for it is too great to be met by the insulin-producing power of the individual cell."

The clinical use of insulin, A. P. THOMSON (*Brit. Med. Jour., No. 3298 (1924), pp. 457–460, fig. 1*).—In the section on diet in this discussion of the treatment of moderately severe cases of diabetes with insulin, three basal diets are described which furnish about 30 calories per kilogram for subjects weighing 44, 64, and 89 kg., respectively, and a fatty acid-glucose ratio of approximately 1.5:1, as recommended by Shaffer. The author has found that in some cases this ratio can be increased to approximately 2:1 without causing acetonuria. This is accomplished by adding 2, 3, and 4 oz. of fat to the different diets. An interesting chart is included in which each day is allowed a space of 3 in., ruled vertically into 24 hours, each representing 1 hour. Spaces are included for recording the protein, fat, and carbohydrate of the meals, the presence or absence of sugar and diacetic acid in the urine, the insulin dosage, blood sugar, and other necessary data, all of which can be entered at the appropriate time.

Iodin deficiency and prevalence of simple goiter in Michigan.—Preliminary report, R. M. OLIN (*Jour. Amer. Med. Assoc., 82 (1924), No. 17, pp. 1328–1332, figs. 5*).—In this preliminary report, the results are summarized of a survey of the extent of simple goiter in four counties in Michigan selected on account of the widely varying content of iodin in the ground water of these counties. The average iodin content of the water in parts per billion was 8.7, 7.3, 0.5, and 0, respectively, and the corresponding percentage of simple goiter 26, 32.7, 55.6, and 64.4 per cent. Other points of interest brought out in the survey were a uniformly higher incidence of goiter among girls than boys, a lower scholastic grade among those affected with enlarged thyroid, and striking differences in the incidence of goiter and in the iodin content of the water in localities separated by only a few miles.

In discussing various methods of preventive treatment, the opinion is advanced that the most practical method, which has not been tried as yet, is that of requiring by law that all salt sold for human and animal consumption in goitrous areas contain sufficient iodin so that the minimum requirements of 300 mg. a year would be normally consumed by everyone in the area.

ANIMAL PRODUCTION.

Further investigations into the changes which occur during the ensilage of a green crop, H. E. WOODMAN and A. AMOS (*Jour. Agr. Sci. [England], 14 (1924), No. 1, pp. 99–113*).—In continuing the study of the chemical changes occurring in green crops during ensiling (E. S. R., 50, p. 267), the composition and character of silage made from a crop of oats, tares, and beans cut for silage on June 14 and 23 and July 12 were determined. On the first date the material was very juicy, and the oats had just flowered. On June 23 the largest bean pods contained half-grown seed, and the oats were in the milk stage. At the third filling the crop was too mature for silage, the oats changing from green to yellow in color, the grain passing out of the milk stage, and the bean and tare pods being full-grown.

In making the silage, the experimental silos were covered with a layer of packed silage about 2 ft. deep, after which two sample bags of the silage, each containing maximum thermometers, were put in and the whole covered with corn silage, with a topping of soil. Sample bags of the material cut on June 30 were also put into a large silo. The types of silage, as described on opening during November, in the order of maturity were silo 1, greenish brown color, with a fruity but pungent odor in the top bag and a fresh but not fruity odor in the lower bag, the temperature of both thermometers registering below 20° C. (68° F.); silo 2, dark olive green color and pleasant fruity odor, the upper and lower thermometers registering, respectively, 20 and 21.5°; silo 3, upper bag contained silage of a brown color, with numerous mold spots and a musty odor and a temperature of 35°. The silage in the lower bag was of a brown color and with an acid but pleasant smell, the temperature record being 24.5°. The bags in the large silo contained good fruity silage and showed temperatures of 28.25 and 25°.

Analyses and weights of the silage at the time of filling the bags and on opening the silos were made for dry matter, organic matter, crude protein, ether extract, nitrogen-free extract, crude fiber, ash, true protein, and amids, and the gains or losses of each determined, from which it was concluded that the percentage loss of dry matter during ensiling decreased as the maturity of the crop increased. The losses of dry matter and crude protein were greatest in the immature silage, the latter resulting in a marked increase in the amids. The same general trends were exhibited in the fat, nitrogen-free extract, and fiber contents, though to a much less extent.

As a result of the work with silage, the authors conclude that, with a fair degree of certainty, too immature silage crops of oats and tares will produce sour silage, and that the matter of real practical importance is whether to cut the crop at early maturity and produce green fruity silage or wait for a greater production of feed at a more mature stage and produce acid brown silage.

The feeding value of sugar beets [trans. title], N. HANSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 251 (1923), pp. 32,* figs. *3*).—The results of experiments with sugar beets containing from 23.4 to 24.8 per cent of dry matter and from 17 to 18 per cent of sugar are reported.

In five experiments with horses the sugar beets were substituted at the rate of 1.04 to 1.09 kg. of dry matter per fodder unit of oats, and in a similar manner for barley in the fattening experiments with swine. In the two experiments with dairy cattle, the swedes and sugar beets were compared on an equal dry matter basis, which resulted in about one-half as much sugar beets being given to one lot as the other lot received of swedes.

The results indicate that, when supplemented by soy bean meal or cake, sugar beets made a satisfactory substitute for oats in the ration of work horses. With swine, the gains made with the sugar beets were slightly better than those made with barley. Similarly satisfactory results were obtained when sugar beets were substituted for swedes in the rations of dairy cattle, but the fat percentage of the milk seemed to be slightly reduced. It was computed that from 4.4 to 4.5 kg. (1.05 to 1.10 kg. of dry matter) of the sugar beets, when supplemented with a satisfactory protein feed, is equal to one fodder unit of oats or barley.

Mineral feeds for farm animals, J. Sotola et al. (*Washington Col. Sta. Pop. Bul. 127* (*1924*), *pp. 3–19, figs. 7*).—The mineral requirements of livestock are discussed, with suggestions as to the feeds and other sources of minerals to supply this need.

Facts on the feeding of livestock [trans. title], R. Menéndez Ramos (*Porto Rico Dept. Agr. and Labor Sta. Circ. 83* (*1924*), *Spanish ed., pp. 5–30*).—The general principles of animal nutrition are discussed with reference to the nutrients in feeds and their digestibility and the balancing of rations for the different classes of animals.

History of Shorthorns in Missouri prior to the Civil War, J. Ashton (*Missouri State Bd. Agr. Mo. Bul., 21* (*1923*), *No. 11, pp. 87, figs. 26*).—This is a popular account of the early history and importations of Shorthorns into America, with special reference to their introduction, establishment, and breeding in Missouri.

History of Baltic cattle breeding [trans. title], P. Stegmann (*Landw. Jahrb., 57* (*1922*), *No. 3, pp. 399–434*).—The development of cattle breeding in Esthonia, Livonia, and Courland, which has been accomplished by improved methods and importations, is briefly reviewed with reference to the disturbing influence of the World War on the progress which was being made.

The beef industry in South Africa, A. M. Bosman (*Union So. Africa Dept. Agr. Jour., 8* (*1924*), *No. 2, pp. 201–212, figs. 5*).—This is a description of the opportunities for beef production in South Africa. A portion of the paper consists of extracts from observations on beef export by S. B. Wollatt.

Dehorning yearling heifers and steers, W. W. Baird (*Canada Expt. Farms, Nappan* (*N. S.*) *Farm, Rpt. Supt. 1922, p. 5*).—It was determined that up to two weeks after dehorning 7 yearling heifers and 2 steers lost an average of 15 lbs. as compared with their weight prior to dehorning. Good gains were made beginning two weeks after the operation.

Asiatic breeds of sheep considered from the standpoint of tail formation, C. C. Young (*Jour. Heredity, 14* (*1923*), *No. 9, pp. 423–432, figs. 9*).—Brief descriptions are given of various types of Asiatic sheep, classified as longtails, shorttails, broadtails, fatrumps, and fattails.

Feeding grain to suckling lambs, R. L. Waddell (*Missouri Agr. Col. Ext. Circ. 139* (*1924*), *pp. 4, figs. 3*).—The use of a creep and the most desirable feeds for suckling lambs are discussed.

The basal metabolism of a growing pig, T. DEIGHTON (*Roy. Soc.* [*London*], *Proc., Ser. B, 95* (*1923*), *No. B 668, pp. 340-355, figs. 4*).—In continuing the studies of metabolism in the pig from the Institute of Animal Nutrition at Cambridge (E. S. R., 48, p. 475), the basal metabolism of a pig weighing about 28 lbs. at 75 days of age was determined at intervals over a period of 14 months, during which time the metabolism increased from 0.47 calorie per minute in the first period to 1.7 calories in the last two periods upon which determinations were made. Calculated on the basis of body surface, the rate of metabolism rapidly increased to about 100 days, with a similar decrease from 120 to 360 days, after which the rate was maintained at about the same level. The results of this experiment also had a bearing on the basal metabolism following the ingestion of food, as the pig received food at 4 p. m. on the first day of each trial.

The results corroborated other investigations by indicating that the maximum of assimilatory activity is reached about five hours after the ingestion of food. Discussions are given of the variations of basal metabolism with age and the use of these results in calculating rations for animals, from which it is shown that the curve for growth and maintenance without fattening can not possibly be a two-thirds power curve.

The requirements of the pig for "vitamin A" and "vitamin C," J. B. ORR and A. CRICHTON (*Jour. Agr. Sci.* [*England*], *14* (*1924*), *No. 1, pp. 114-125*).—The results of three experiments dealing with the vitamin A and C requirements of pigs are reported from the Rowett Institute.

In the first experiment two lots of 4 pigs weighing from 10 to 14 kg, each were fed on a concrete floor for 111 days on a basal ration of bran, middlings, crushed oats, corn meal, and blood meal (1:1:1:1:0.25), with the daily addition per pig of 15 gm. of calcium phosphate, 2 gm. of magnesium sulphate, 2 gm. of potassium carbonate, 1.5 gm. of ferric chlorid, and 10 cc. of cod liver oil. One lot of pigs also received 1 cc. of lemon juice per kilogram of live weight daily. Two lots of guinea pigs were fed on similar rations except that the amount of lemon juice given was relatively five times as great. Scurvy developed during the third week in both lots of guinea pigs, but no signs of ill health were observed in the swine. The average daily gains of 0.465 kg. made by the pigs receiving no lemon juice were slightly greater than the gains of those receiving the lemon juice, 0.421 kg.

The second experiment dealt with the effect of a vitamin A deficient ration on pigs of a similar size. The basal ration consisted of equal parts of bran and crushed oats, with 4 per cent of blood meal plus a similar mineral mixture and calcium carbonate and sodium hydroxid, with 20 cc. of fresh swede juice per pig daily. Ten cc. of cod liver oil were given to each pig of one lot daily and a like amount of linseed oil to the other lot. During the 110 days of this test practically identical gains were made by the two lots, and all were in good condition.

In a third experiment, four lots of 3 pigs averaging about 40 kg. each were fed on a ration of potatoes, middlings, locust bean meal, and white fish meal which was boiled for one hour and allowed to cool before feeding. Additional supplements were supplied daily per lot, as follows: Lot 1, 60 cc. of cod liver oil and 400 gm. of fresh grated swede turnip; lot 2, 1,300 gm. of fresh cut pasture grass; lot 3, 150 gm. of oatmeal; and lot 4, pasture at will. During the 64-day feeding period, the average gains in lots 1 to 4 were, respectively, 49.5, 47.2, 48.8, and 48 kg. Two of the oatmeal pigs, when continued on the same ration for another 64 days, made good gains and maintained their condition.

The results of these experiments are thoroughly discussed in the light of related studies, from which it is concluded that the pig's requirements of vitamins A and C are so low during the usual fattening period that there is little likelihood of fattening pigs suffering from a vitamin deficiency.

[Fecundity and growth in swine], F. G. Helyar (*New Jersey Stas. Rpt. 1922, pp. 123, 124*).—The preliminary results of a study of the fertility of sows and rates of growth of their young are tabulated. A total of 17 Duroc-Jerseys and 5 Berkshire sows were used in the experiments. The Duroc litters averaged 10.8, while the Berkshire litters averaged 8. The average weights per pig were 2.55 and 2.57 lbs., respectively. Eight and seven of the Duroc-Jersey and Berkshire pigs, respectively, were weaned per litter, at which time their average weights were 25.8 and 24.9 lbs.

Estimation of the weight of hogs by measurements [trans. title], P. Dechambre and E. Degois (*Rev. Zootech. [Paris], 3 (1924), No. 2, pp. 75–86, figs. 2*).—This is a discussion of the use of different measurements in estimating the weights of swine, based on measurements and live and dressed weights of 35 hogs of the three breeds Craonnais, Bayeux, and Middle White. It was found that the results as estimated by the systems used were usually within 10 per cent of accuracy.

Biometrical investigations of thoroughbred horses, with conclusions as to their running ability, J. Stratul (*Biometrische Untersuchungen an Vollblutpferden mit Rückschlüssen auf Rennleistung. Inaug. Diss., Tierärztl. Hochsch., Berlin, 1922, pp. [12], figs. 2*).—The average length of 17 body measurements and 9 angles in 102 thoroughbred horses, classified into three groups according to the amounts of money which they have won in races, are tabulated and discussed.

[Experiments with poultry at the Nappan Experimental Farm], W. W. Baird (*Canada Expt. Farms, Nappan (N. S.) Farm, Rpt. Supt. 1922, pp. 74–81*).—Several experiments dealing with the incubation of chicks and the feeding of hens have been conducted.

Incubator comparisons.—The following percentages of fertile eggs hatched in the Prairie State and Tamlin incubators, respectively: During April 42 and 57 per cent and during May 67 and 59 per cent. The hatching figures for May were also tabulated according to breeds, with similar results in the two machines. Of the total fertile eggs incubated in April only 26.7 per cent hatched as compared with 61.5 per cent of the eggs set in May. A larger percentage of the May eggs were fertile. Classifying the same eggs on the basis of breeds, 84 per cent of the Rock eggs were fertile, of which 40 per cent hatched, whereas 90 per cent of the Leghorn eggs were fertile, of which 61 per cent hatched. Of the hens' eggs of both breeds which were set, 86 per cent were fertile, of which 48 per cent hatched, whereas 78 per cent of the pullets' eggs were fertile, but only 17 per cent of these hatched. Comparisons are also given of the Rock and Leghorn eggs hatched in April and May.

[*Feeding for egg production*].—One lot of 10 birds, receiving a ration of which the mash consisted of about 15 per cent of beef scrap and blood meal, produced an average of 58.7 eggs per bird from November 1 to April 30. Another similar lot receiving the same ration except that skim milk was substituted for the meat scrap and blood meal, produced an average of 72.7 eggs per bird. The estimated cost per dozen eggs was 22 cts. as compared with 31.5 cts. in the former lot.

Home mixed feeds versus commercial feeds.—In another experiment a home mixed scratch feed of wheat, oats, and corn, and a mash of bran, shorts, corn meal, crushed oats, oil cake, blood meal, beef scrap, and charcoal were compared with commercial feeds for egg production, using two lots of 50 birds each. An average of 50.8 eggs per bird was produced on the home mixed ration from November 1 to April 30, while the commercial feed produced 46.7 eggs per bird. The latter ration was also more expensive.

Poultry meat production (roasters and capons), W. C. THOMPSON (*New Jersey Stas. Rpt. 1922, pp. 164–168, pl. 1*).—In an experiment in which Jersey Black Giant chicks were raised to 9 weeks of age and the cockerels caponized and separated, it was found that the pullets gained an average of 3.5 lbs. to 16 weeks of age and the capons gained an average of 3.7 lbs. A mash and a scratch feed plus semisolid buttermilk made up the ration. The mortality was 15 per cent for the pullets and 23.2 per cent for the capons, the greater loss in the latter case being due to fatalities at the time or following caponizing. Both the pullets and the capons consumed an average of 1 lb. of feed per week.

In another experiment a study was made of the process of finishing roasters weighing from 5.5 to 6.5 lbs. These birds made average gains of 0.44 lb. per bird in 10 days' feeding on a wet mash of corn meal, wheat middlings, wheat bran, and semisolid buttermilk (diluted 1:7), 7:3:1:22, respectively. Of the wet feed, 16.9 lbs. were required to produce 1 lb. of gain.

Leg weakness in growing chicks, C. W. CARRICK (*Purdue Agr. Ext. Bul. 123 (1924), pp. 12, figs. 5*).—This is a popular discussion of the symptoms of leg weakness, with special reference to the use of vitamin rich rations in preventing the condition.

The relative value of meat scrap, powdered buttermilk, powdered skim milk, and semi-solid buttermilk as developing feeds for White Leghorn pullets, W. C. THOMPSON (*New Jersey Stas. Rpt. 1922, pp. 159–164, pls. 2*).—In addition to a basal grain and scratch ration, the addition of meat scrap, powdered buttermilk, powdered skim milk, and semisolid buttermilk were compared with no animal protein for raising baby chicks to 17 weeks of age. There were 50 chicks of each age per lot. The mortality with the respective protein supplements was 8, 12, 4, 16, and 38 per lot. The total average gains per bird were 1.9, 2.3, 2.1, 2.1, and 1.1 lbs., the total feed consumption averaging 10.7, 11.5, 10.4, 11.3, and 7.6 lbs. per bird. Since the results are only preliminary, being for a 17 weeks' period only, no definite conclusions are drawn, but the necessity of animal protein in the ration seems to have been demonstrated.

The effect of accessory food factors on egg production, R. T. PARKHURST and R. E. NEIDIG (*Poultry Sci., 3 (1924), No. 4, pp. 149–152*).—Preliminary experiments dealing with the effect on egg production and health of supplements of cod liver oil, marmite, and lettuce to a normal ration of grain mash and minerals are reported from the Idaho Experiment Station. The amount of cod liver oil fed consisted of 1 oz. daily per 25 hens. The egg production was slightly increased by this supplement, and the vigor of the birds was much better than in a similar lot receiving no cod liver oil. In March, the latter lot also developed a disease similar to the nutritional disease resembling roup previously described by Beach and Freeborn (E. S. R., 48, p. 780), and 13 of the 25 birds died. This same disease developed in July in the lot receiving marmite from May 1 on, but did not develop in the lot receiving lettuce. The egg production of the lettuce-fed pen was considerably higher than that of any of the other pens.

The relation of external body characters to annual production in Barred Plymouth Rocks, G. W. HERVEY and H. R. LEWIS (*Poultry Sci., 3 (1924), No. 3, pp. 109–112*).—In a study from the New Jersey Experiment Stations of the relation between body characters and annual egg production the following correlation coefficients were determined in July between the first year's annual production and the body characters of 80 Barred Rocks: Pigmentation of shanks −0.1677±0.0733, pigmentation of vent −0.2936±0.0689, pigmentation of beak −0.2435±0.0709, condition of molt −0.0824±0.0749, body weight 0.1269±0.0742, quality of pelvic bones 0.0384±0.0753, and spread of pelvic bones 0.3961±0.0645.

It was concluded that July was too early to cull these birds on the basis of external body characters.

Egg weight in relation to production.—I, The relationship of the weights of the parts of the egg to the total egg weight, M. A. Jull (*Poultry Sci., 3 (1924), No. 3, pp. 77–88*).—The 413 eggs laid by six Barred Plymouth Rock pullets throughout a year's production at Macdonald College, Canada, have been weighed and the relative weights of the albumen, yolk, and shell of each determined. Correlation coefficients between the total weight and the weights of the different parts were as follows: Albumen, 0.922±0.005, yolk 0.820±0.011, and shell 0.644±0.019. In classifying the eggs into three size groups of 36–46, 46–56, and 56–66 gm., it was found that the eggs in the respective groups consisted of an average of 59.16, 58.27, and 58.36 per cent albumen, 30.09, 31.19, and 31.16 per cent yolk, and 10.75, 10.54, and 10.48 per cent shell. These data thus indicate that the smallest eggs contain the largest percentages of albumen and shell and the smallest amount of yolk.

Further treatment of the data showed that the second eggs of clutches were not as heavy in both total egg weight and yolk weight as the first egg of the clutch, except with one pullet. It was also found that the percentage of yolk was greater in the second egg with the one exception.

In a further classification, the eggs were divided according to the month in which they were laid. The mean egg weights were found to increase from December (the month laying started) to February, with considerable reductions in the weights of the eggs laid from April to September, and with increases again in October and November. The percentage of albumen decreased from December to February, increased to April, and decreased during May and June, after which it remained fairly constant following a slight increase. A comparison of the annual yolk percentage indicated that there was independent variation between the amount of yolk and the albumen secreted. The rate of egg production seems to have a bearing on both percentages, however.

An analysis of the production performance for two years of the 200-egg pullet, W. C. Thompson (*New Jersey Stas. Rpt. 1922, pp. 144–158, pl. 1, figs. 4*).—The egg records of 127 White Leghorns which produced over 200 eggs in their pullet year were analyzed by weekly periods for both the pullet and yearling years. The average production during the winter of the second year was considerably lower than in the first year, but the spring and summer-fall productions, though definitely low in the second year, approached that of the first year. Correlation coefficients were calculated between the eggs produced during the different seasons of both years.

An analysis of individual egg-production records (*New Jersey Stas. Rpt. 1922, pp. 140–144*).—A study by D. F. Irving and R. E. Cray of the records of five years' egg-laying contests at Vineland and one year at Bergen has shown the importance of careful culling and feeding for maximum egg production. Within limits, a definite relationship has been obtained between the egg production and the amount of mash consumed.

The variation of eggs in the rate at which they lose weight, L. C. Dunn (*Poultry Sci., 3 (1924), No. 4, pp. 136–148*).—This is the concluding paper of this series (E. S. R., 50, p. 374). Further discussion is given to the hatchability of eggs losing varying percentages of their weight during the first 7 and 14 days, respectively, of incubation, from which no evident relationship was established between the way an egg loses weight and its hatchability except in the case of extremely porous shelled eggs having unusually high rates of evaporation. The author further shows that any hereditary condition of eggs deleterious to hatchability would gradually tend to be eliminated.

All fowls and their varieties, H.-L.-A. Blanchon and Count Delamarre de Monchaux (*Toutes les Poules et Leurs Variétés. Paris: Charles Amat, 1924, pp. VI+642, pls. 16, figs. 184*).—This book gives briefly the origin, description, standards, breed associations, and other miscellaneous information, including illustrations of most of the breeds and varieties of fowls of the different countries of the world. Incubation, brooding, diseases, and the general management of poultry are also briefly discussed.

The growing of ducks and geese for profit and pleasure, J. H. Robinson (*Dayton, Ohio: Rel. Poultry Jour. Pub. Co., 1924, pp. 447, figs. 252*).—This is a popular manual on the production of ducks, geese, and ornamental water fowl.

DAIRY FARMING—DAIRYING.

Mineral metabolism studies with dairy cattle, H. G. Miller, P. M. Brandt, and R. C. Jones (*Amer. Jour. Physiol., 69 (1924), No. 1, pp. 169–176*).—In an experiment at the Oregon Experiment Station, the average daily balances of nitrogen, sulphur, phosphorus, chlorin, calcium, magnesium, potassium, and sodium were determined during two 3-week periods for cows from the fifteenth to the twenty-third day of lactation. The cows received a basal ration of 10 lbs. of red clover hay, 30 lbs. of oat and vetch silage, and approximately 1 lb. of a grain mixture (corn, bran, and oil meal, 58:32:10) per 4 lbs. of milk produced. During the first 3 weeks the basal ration only was fed, but during the second 3 weeks cow 1 received an additional supplement of 150 gm. of bone meal per day, cow 2 received 20 lbs. of fresh kale, and cow 3 was fed the same as cow 1 except that the period was 2 weeks in length. The following table gives the average daily mineral balances determined.

Mineral balances in dairy cows fed various rations.

Cow number	Period.	Average daily milk yield.	Average daily mineral balances.							
			Nitrogen.	Sulphur.	Phosphorus.	Chlorin.	Calcium.	Magnesium.	Potassium.	Sodium.
		Kg.	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*
1	1	19.55	−23.5	+1.1	−5.0	−1.2	−5.4	+1.8	+2.4	+1.8
	2	19.04	−12.7	+2.1	+5.4	−1.4	+3.8	+1.8	+1.9	+1.0
2	1	20.64	−23.0	+1.0	−7.31	−.2	−7.4	+2.2	+6.0	+2.5
	2	23.29	−1.7	+4.0	+.04	−1.4	−4.0	+1.9	−.2	−2.6
3	1	18.93	−15.1	−1.9	−4.4	+3.2	−6.0	+3.3	+8.3	+5.4
	2	19.83	−15.9	+1.3	+6.5	−3.5	+5.8	+2.1	−1.9	−1.4

The addition of bone meal to the ration changed negative calcium and phosphorus balances to positive balances. The green kale increased the calcium and phosphorus assimilation and maintained a higher milk yield. Difficult of interpretation are the positive sulphur balances throughout the experiment, accompanied by a loss in body weight and negative nitrogen balances.

Feeding experiments with corn brewery waste at the High School of Agriculture and Brewing at Weihenstephan [trans. title] (*Landw. Jahrb., 59 (1924), No. 3, pp. 435–451, fig. 1*).—Reports of the effect of feeding brewery waste on the production and fat content of milk are given in two papers.

***Report of the Institute of Agricultural Chemistry at Weihenstephan,* H. Niklas, A. Strobel, and K. Scharrer** (pp. 435–446).—In this experiment two groups of 8 cows each were fed during three 10-day periods, with 10-day transition periods between each and a 20-day preliminary period on rations containing from 30 to 60 liters of corn brewery waste per cow per day in addition to a basal ration of 8 kg. of hay, 8 kg. of straw, and 8 kg. of beets per 1,000 kg. of live weight. During the preliminary period the cows of both groups received 30 liters of the brewery waste in addition to the basal ration. During period 1 and the transition period preceding it group 1 received 60 liters of brewery waste and group 2 40 liters of brewery waste and 4 kg. of coconut cake per 1,000 kg. of live weight. During period 2 and the transition period preceding it group 1 received 30 liters of brewery waste and group 2 40 liters of brewery waste. During period 3 and the transition period preceding it groups 1 and 2 were each fed as during period 1.

The average daily milk production was for groups 1 and 2, respectively, during the last 9 days of the preliminary period 62.7 and 63.1 kg., during the transition period preceding period 1, 69.8 and 70.3 kg.; during period 1, 71.2 and 68.9 kg.; during the transition period preceding period 2, 62.4 and 63.2 kg.; during period 2, 61.5 and 60.7 kg.; during the transition period preceding period 3, 64.5 and 62.5 kg.; and during period 3, 66 and 62.8 kg. The comparison thus indicates a slight superiority of the brewery waste over coconut cake in the matter of milk production. The animals maintained practically uniform average weights throughout.

Report of the South German Institute of Dairying at Weihenstephan, A. Fehr, K. Zeiler, and F. Kieferle (pp. 446–451).—The average fat content of the milk produced during the different periods in the above experiment by the two groups of cows was, respectively, for the preliminary period 3.66 and 3.74 per cent; during the transition period of period 1, 3.42 and 3.58; during the first period 3.36 and 3.62; during the transition period of period 2, 3.37 and 3.52; during period 2, 3.49 and 3.60; during the transition period of period 3, 3.43 and 3.63; and during period 3, 3.36 and 3.50 per cent. Some slight differences in the quality of the butterfat produced in the different periods were observed.

Feeding experiments, Bangalore, R. W. LITTLEWOOD (*Madras Agr. Dept. Yearbook, 1923, pp. 43–54*).—The results of three comparative feeding tests with dairy cattle are reported.

[*Rice bran as a supplement*].—Two lots of 6 cows were fed on a daily basal ration of 3 lbs. of cottonseed meal, 3 lbs. of wheat bran, 2 lbs. of gram husk, 16 lbs. of brewers grain (wet), 20 lbs. of silage, 10 lbs. of green grass, 5 lbs. of hay, and 1 oz. of salt, with the addition of 3 lbs. of rice bran to the cows of one lot. In a 5 weeks' period the lot receiving the rice bran produced 4,487 lbs. of milk as compared with 4,089 lbs. produced by the other lot. It is calculated that the extra milk more than paid for the rice bran consumed.

[*Green feed v. silage*].—This experiment was conducted over a period of 2 months, during which one lot of 6 cows received daily 12 lbs. of corn and cholam silage in addition to the basal ration and another lot received 20 lbs. of green Rhodes grass in place of the silage. The sickness of 2 cows during the experiment interfered with the results, but the author concludes that the feeding values of the two feeds were about equal in the amounts as compared.

[*Peanut cake v. linseed cake v. gingelly cake*].—Supplements of 2 lbs. of peanut cake, linseed cake, or gingelly cake were compared when added to a basal ration for milk production. The total yields of the 5 cows in each lot during the 6 weeks were as follows: Linseed cake, 4,752; peanut cake, 4,927; and gingelly cake, 4,998 lbs. Based on the relative costs of the feeds and the yields, peanut cake is recommended for general use.

Grazing heifers on stump pasture, M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1922–1923, pp. 29, 30*).—The 1922 and 1923 results in the continuation of this test (E. S. R., 48, p. 377) are given. In the first year pasturing began on May 24 and continued to November 1, and in the second year pasturing began on May 28 and continued to October 20. The heifers were, however, continued on day pasture until the middle of December. The average daily gains made during 1922 were 1.17 lbs., and during 1923, 1.57 lbs.

The value of feeds for growing calves [trans. title], V. F. JOHANSON (*Lantbr. Vetensk. Samfund. Finland Meddel. No. 7 (1923), pp. 42.*)—This work, which is summarized in German, deals with the feed requirements of two calves, with nutrient balances for each, through four periods of 8, 8, 9, and 9 days' duration. During the first period the calves received only whole milk in amounts of 7 and 6 kg., respectively, per day. From the results it was calculated that 4.04 kg. of milk for the first calf and 3.9 kg. for the second calf were equivalent to one fodder unit, and were equivalent to 2.51 and 2.494 digestible calories, respectively.

During period 2 calves 1 and 2 received, respectively, 10 and 8 kg. daily of skim milk. During this period it was calculated that 7.31 and 7.15 kg. were equivalent to one fodder unit, which equaled 2.477 and 2.491 calories. During period 3 the calves received a ration of hay, linseed meal, wheat bran, skim milk, water, salt, and feeding bone meal. The results of the experiment indicated that the feeding value of linseed meal was reduced when it was included in large amounts in the ration. The addition of bone meal was unnecessary. The calculated heat value of the digestible portion of the ration was equivalent to 3.451 and 3.407 calories, respectively, with the 2 calves. During period 4 the calves received the same ration as during period 3, except that the feeding bone meal was replaced by fertilizing bone meal. The total ration consisted of 1.86 fodder units and 1.45 kg. of starch value for calf No. 1 and 2.38 fodder units and 1.68 kg. of starch value for calf No. 2.

The author concludes from the experiments that the calculations of the nutrient requirements of calves on the basis of a starch value are unsatisfactory.

Raising dairy calves, E. WEAVER, J. M. SHAW, and F. ELY (*Iowa Sta. Circ. 91 (1924), pp. 3–23, figs. 4*).—Popular directions are given for raising dairy calves, dealing with the important considerations of the breeding of calves, feeds to be used, diseases, and methods of management.

Testing dairy cows for herd improvement, L. T. MACINNES (*N. S. Wales Dept. Agr., Farmers' Bul. 145 (1923), pp. 50, figs. 19*).—The first part of this bulletin deals with the organization and control of herd-testing associations and the second part with the method of testing milk by the Babcock test.

Grading up experiment, W. W. BAIRD (*Canada Expt. Farms, Nappan (N. S.) Farm, Rpt. Supt. 1922, pp. 11, 12, 14*).—The milk and fat production of cows produced by several crosses of purebred Ayrshire and Holstein bulls since 1911 are given and compared with the production of their dams at like ages, and the improvement brought about by better breeding is thus indicated.

Dairying in South Africa for intending settlers, E. O. CHALLIS (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 2, pp. 213–220, figs. 5*).—This is a description of dairying practices in South Africa.

History of Queensland dairying, together with investigation of its problems of production and marketing, E. GRAHAM ET AL. (*[Brisbane: Queensland Producers' Assoc., Council Agr.], 1924, pp. [4]+128, pls. 19, figs. 10*).—This deals with the history of dairying in Queensland, and describes the methods of production, manufacture, marketing, and export of dairy products, with particular emphasis on the side of cooperative marketing.

The Friesian method of removing cream [trans. title], H. A. Sirks (*Milchw. Forsch., 1 (1924), No. 2, pp. 107–130*).—The results of experiments are reported from the agricultural experiment station at Hoorn dealing with factors affecting the thoroughness and rapidity with which cream can be removed from milk. Variations in the stage of lactation, size of the fat globules, protein content, temperature, and treatment of the milk did not lead to any definite conclusions as to the fundamental cause of the variability experienced, except that in certain samples the fat globules tended to unite much more readily than in others. The possibility of the globules possessing electrical charges of greater or less potentiality which aid or retard the union is suggested.

The method of grading used in these tests was based on the percentage of the fat in the milk which was removed in the cream.

Tests of the four-compartment pasteurizer of the Ahlborn firm in Hildesheim [trans. title], Martiny (*Milchw. Forsch., 1 (1924), No. 2, pp. 77–106, figs. 7*).—An extensive series of tests by Becker and Butenschön of the time required for pasteurizing and the keeping qualities of milk pasteurized in a four-compartment pasteurizer of varying capacities at 14 different plants has given generally favorable results. The milk was found to develop acidity slower than nonpasteurized milk, and in most cases it kept in good condition for over four days at room temperature. Certain mechanical defects of the pasteurizer are pointed out, such as leaky valves and a wooden covering.

Starter for butter, cheese, sour cream, and commercial buttermilk, E. S. Guthrie and W. W. Fisk (*N. Y. Agr. Col. (Cornell) Ext. Bul. 76 (1923), pp. 15, figs. 5*).—The preparation and use of starters, both in the creamery and on the dairy farm, are discussed.

Review of work on the bacteriology of milk, butter, cheese, and other dairy products during 1914 to 1920 [trans. title], F. Ditthorn (*Milchw. Forsch., 1 (1924), No. 2, Ref., pp. 41–82*).—This is a review of dairy bacteriology during this period.

VETERINARY MEDICINE.

Special pathology and therapy of the domestic animals, F. von Hutyra and J. Marek (*Spezielle Pathologie und Therapie der Haustiere. Gena: Gustav Fischer, 1922, 6. ed., rev. and enl., vols. 1, pp. XVI+1046, pls. 19, figs. 259; 2, pp. XII+799, pls. 3, figs. 172; 3, pp. XII+812, pls. 6, figs. 187*).—The first of the three volumes of this new edition (E. S. R., 44, p. 577) is by Von Hutyra and deals with the infectious diseases; the second, by Marek, deals with the diseases of the organs of digestion, respiration, and circulation; and the third, also by Marek, with diseases of the urinary organs, of the blood and blood-forming tissues, of metabolism, of the nervous system, and of the locomotor organs and skin. The work has been increased by about 250 pages in order to bring it up to date, and many of the articles have been to a large extent rewritten. In the first volume there is an entirely new chapter devoted to paratyphoid affections in the lower animals. The chapters in which extensive alterations have been made include those dealing with the piroplasmoses, epizootic lymphangitis, and contagious abortion. Of the illustrations, some 125 are new.

Veterinary materia medica and therapeutics, E. W. Hoare (*London: Baillière, Tindall & Cox, 1924, 4. ed., rev., pp. XII+664*).—This is a new edition of the work previously noted (E. S. R., 37, p. 76), edited and revised by J. R. Greig.

Annual reports of the official veterinarians of Prussia for 1914–1918 and 1919 [trans. title], Wiemann (*Veröffentl. Jahres-Vet. Ber. Tierärzte*

Preuss., 15 (1914–1918 [pub. 1923]), pts. 1–2, pp. 94; 16 (1919), pts. 1 [pub. 1923], pp. [3]+90, pls. 12; 2 [pub. 1924], pp. IV+99).—These are the usual reports (E. S. R., 45, p. 73), dealing with animal diseases in Prussia during the years 1914 to 1918 and the year 1919, respectively, and with the statistical data presented in tabular form.

Poisonous plants of Alabama, C. A. CARY, E. R. MILLER, and G. R. JOHNSTONE (*Ala. Polytech. Inst. Ext. Circ. 71 (1924), pp. 42, figs. 39*).—In this account of poisonous plants of Alabama, the taxonomic information is by Johnstone, and the toxicological and therapeutic data are by Cary and Miller.

The meadow death camas (Zygadenus venenosus) as a poisonous plant, C. D. MARSH and A. B. CLAWSON (*U. S. Dept. Agr. Bul. 1240 (1924), pp. 14, pls. 2, figs. 2*).—This is a report of investigations of and feeding experiments with *Z. venenosus*, a species of death camas that is especially characteristic of the States bordering on the Pacific Ocean. While it affects sheep more than any other class of animals, many horses are poisoned and some are killed. Although it is poisonous to cattle, under range conditions few are injured, and swine are probably not harmed because they promptly expel the plant by vomiting. This species is about equally toxic with grassy death camas (*Z. gramineus*), and these plants are three times as toxic as the Great Basin foothill death camas (*Z. paniculatus*) and seven times as toxic as the mountain death camas (*Z. elegans*).

While *Z. venenosus* and *Z. gramineus* have about the same toxic dose, the lethal dose of *Z. venenosus* is much greater. It follows that in the production of deaths *Z. gramineus* is the more dangerous. *Z. venenosus* and *Z. paniculatus* are about equally dangerous so far as the production of deaths is concerned.

The excretion of tryparsamide, A. G. YOUNG and C. W. MUEHLBERGER (*Jour. Pharmacol. and Expt. Ther., 23 (1924), No. 6, pp. 461–464, fig. 1*).—The authors find that at least part of tryparsamid is excreted unchanged in the urine. "Three out of four individuals studied excreted 88 to 95 per cent of the drug within the first 24 hours. Certain individuals show a much slower rate of excretion. These individuals retain the arsenic over a much longer period of time and, therefore, may be more susceptible to cumulative effects of the drug. In such cases it might be advisable to increase the interval between the repeated medication beyond the usual weekly period."

On the disinfection of animal bones [trans. title], A. IIZUKA and T. WATANUKI (*Jour. Japan. Soc. Vet. Sci., 3 (1924), No. 1, pp. 1–15*).—The authors found that the addition of paraformaldehyde considerably increased the disinfecting power of petroleum benzene, and that at temperatures of 45, 53, and 65° C. anthrax spores were destroyed in 90, 60, and 40 minutes, respectively.

X-ray treatment of infection, W. T. V[AUGHAN] (*Jour. Lab. and Clin. Med., 9 (1924), No. 8, pp. 584–586*).—The progress of roentgen treatment of localized infectious processes is reviewed.

Natural antisheep amboceptor and complement in the blood of fowls, F. R. BEAUDETTE and L. D. BUSHNELL (*Jour. Agr. Research [U. S.], 27 (1924), No. 9, pp. 709–715*).—In this contribution from the Kansas Experiment Station experimental data are reported on an examination for antisheep amboceptor and complement of the blood sera of a flock of 22 fowls. All of the birds were bled from the heart, and the samples of blood thus obtained were allowed to clot and the serum, after centrifugation, removed to sterile tubes. In each sample of serum the amboceptor was first absorbed with washed sheep cells at 0° C., the sediment removed by centrifugation and tested for amboceptor, and the supernatant liquid tested for complement. The conclusions drawn for the data obtained are summarized as follows:

"Most samples of fresh chicken serum are capable of causing some hemolysis of sheep cells. The small quantity of natural antisheep amboceptor contained in normal chicken serum may be separated from the complement by absorption with sheep cells at 0°. The quantity of hemolysis does not vary appreciably in different individuals. The quantity of complement is small as compared with that contained in guinea pig serum. A variation in the quantity of complement existed in the samples tested. Hemagglutinins for sheep cells are present in fowl sera, but the quantity is not in proportion to the degree of hemolysis."

Fungus parasites of man and the lower animals, A. SARTORY (*Champignons Parasites de l'Homme et des Animaux. Paris: E. Le François, 1920, Nos. 1, pp. 1–39; 2, pp. 41–88, figs. 27; 1921, Nos. 3, pp. 89–173, figs. 45; 4, pp. 179–308, figs. 30; 5, pp. 309–378, figs. 46; 6, pp. 381–484, figs. 41; 1922, No. 7, pp. 485–544, figs. 22*).—An account of the fungus parasites of animals.

Blastomycotic infection of the nervous system, J. G. GREENFIELD (*Med. Sci., Abs. and Rev., 10 (1924), No. 4, pp. 267–273*).—This paper deals with the classification of the causative organisms or yeastlike fungi, dividing them into four groups, and with their pathological characteristics. A list of 24 references to the literature is included.

Pulmonary mycoses and the causative parasites, A. SARTORY and A. BAILLY (*Les Mycoses Pulmonaires et Leurs Parasites. Paris: Clinique et Laboratoire, 1923, pp. 335, figs. 127*).—This is a manual on fungus parasites of animals and the pulmonary affections they cause.

The relationship between the ascarids of man, pig, and chimpanzee, H. THORNTON (*Ann. Trop. Med. and Parasitol., 18 (1924), No. 1, pp. 99, 100, figs. 2*).—It is pointed out that morphologically the Ascaris of the pig and of the chimpanzee can not be distinguished from the Ascaris of man.

A pig nematode, Gnathostoma hispidum Fedchenko, as a human parasite, K. O. R. MORISHITA (*Ann. Trop. Med. and Parasitol., 18 (1924), No. 1, pp. 23–26*).—The author records a case from Japan in which this species occurred as a human parasite.

Contribution to the knowledge of anaplasmosis [trans. title], HELM (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 25 (1924), No. 4, pp. 199–226, figs. 2*).—This is a report of studies of the Anaplasma bodies found in the blood of a German ox which had been injected intravenously 19 days previously with 150 cc. of defibrinated blood from one of several dairy cows imported from Texas. Simultaneously, there was observed a lymphocytosis, but there were no clinical symptoms of infection. In experiments with *Ixodes ricinus*, it was found that the larvae from females engorged on Texas animals were capable of transmitting the infection. A list is given of 47 references to the literature.

Discovery of the cause of foot-and-mouth disease [trans. title] (*Berlin. Tierärztl. Wchnschr., 40 (1924), No. 15, pp. 185–187; abs. in Vet. Jour., 80 (1924), No. 587, pp. 181, 182; Vet. Med., 19 (1924), No. 6, p. 350*).—The discovery by Dahmen and Frosch of the causative organism of foot-and-mouth disease, to which the name *Loefferia nevermanni* has been given, is reported. This discovery is said to have been made with the aid of a special photographic apparatus constructed at Jena. By a special method, the organism can be separated from the aphthous fluid, cultivated on nutrient media, and reproduced with active and virulent properties for several succeeding generations. Reproduction from these cultures of foot-and-mouth disease in its typical form in susceptible animals is said to take place.

The scientific means of combating foot-and-mouth disease [trans. title], J. LIGNIÈRES (*Rec. Méd. Vét., 100 (1924), No. 2, pp. 58–83; abs. in North Amer.*

Vet., *5* (*1924*), *No. 5*, *pp. 191–196*).—This is a summary of measures other than slaughter for combating this disease.

Foot-and-mouth disease (*Nature* [*London*], *113* (*1924*), *No. 2841*, *pp. 537*, *538*).—This is a review of the situation in Great Britain, with data on recent investigations of the disease.

Report of the Netherlands Commission on Foot-and-Mouth Disease (*Verslag van de Staatscommissie in Zake Mond- en Klauwzeer. The Hague:* [*Govt.*, *1922*], *pp. V+134*, *pls. 2*).—This detailed report of the Netherlands commission includes a chart showing the occurrence of foot-and-mouth disease in the Netherlands from 1892 to 1920.

Supplements to the report of the Netherlands Commission on Foot-and-Mouth Disease (*Bijlagen Behoorende bij het Verslag der Staatscommissie in Zake Mond- en Klauwzeer. The Hague:* [*Govt.*, *1922*], *pp.* [*XX+354*]).—The supplements to the report above noted, of which there are seven, include reports of a subcommittee on the outbreaks of the disease in the Netherlands, with statistical data presented in tabular form, and of committees on control work with the disease in Switzerland and in England, and papers on control measures by J. Poels and L. de Blieck.

Trypanosomiasis in camels: Its detection by complement fixation, H. W. Schoening (*Jour. Infect. Diseases*, *34* (*1924*), *No. 6*, *pp. 608–613*).—The author reports upon complement fixation tests made of the blood of camels that were being introduced into the United States. By means of this test several of the animals were discovered to be infected with a trypanosome other than *Trypanosoma equiperdum.*

"The results now recorded, in which a trypanosome other than *T. equiperdum* was involved, and serum from a species of animal other than the horse was used, indicate that the test is applicable as a diagnostic agent in ruminants affected with trypanosome of the *T. brucei* group."

The first recognition of bovine trypanosomiasis in Argentina [trans. title], R.-L. Dios and J.-A. Zuccarini (*Compt. Rend. Soc. Biol.* [*Paris*], *91* (*1924*), *No. 20*, *pp. 23*, *24*).—The authors record the discovery of a trypanosome in the blood of a bovine in the Province of Entre Ríos, which appears in a large and in a small form. This trypanosome is said to show the morphological characteristics of *Trypanosoma theileri*, which was discovered by Theiler in 1902 in the blood of bovines in the Transvaal and was described by Laveran and Bruce.

Control of the cattle tick in New South Wales, C. J. Vanderson (*Vet. Rec.*, *4* (*1924*), *No. 25*, *pp. 540–543*, *544*).—This is a discussion of the cattle tick in New South Wales, where infestation by the pest is confined to an area of about 60 miles square, situated in the northeastern corner of the State and adjoining the Queensland border.

Ticks on cattle and other stock: The North Auckland investigation, J. G. Myers (*New Zeal. Jour. Agr.*, *28* (*1924*), *No. 5*, *pp. 306–314*, *figs. 5*).—This is a report of observations, extending over a period of one year, of the cattle tick *Haemaphysalis bispinosa* Neum. in the North Auckland district.

Our present knowledge regarding white scours and similar diseases in calves, W. Pfenninger (*Jour. Amer. Vet. Med. Assoc.*, *65* (*1924*), *No. 2*, *pp. 168–188*, *figs. 4*).—This summary of the present status of knowledge of the subject includes a list of 32 references to the literature.

The diseases of sheep, G. Moussu (*Les Maladies du Mouton. Paris: Vigot Bros.*, *1923*, *pp.* [*4*]*+332*, *pls. 8*, *figs. 114*).—This is a manual on the diseases of sheep.

Piroplasmosis of sheep in Algeria: A study of Piroplasma (Gonderia) ovis [trans. title], E. SERGENT, L. PARROT, and D.-N. HILBERT (*Arch. Inst. Pasteur Algérie, 1 (1923), No. 2, pp. 127–135, fig. 1*).—The authors report upon an epizootic of piroplasmosis which occurred in the vicinity of Oran in March, 1920, in Southdown sheep imported for crossing with the native race.

Tick paralysis observed on the sheep in the region of Sitia, Crete [trans. title], G. BLANC and J. CAMINOPETROS (*Bul. Soc. Path. Exot., 17 (1924), No. 5, pp. 378–381*).—The authors record observations of tick paralysis of sheep in Crete, two species of ticks, *Ixodes ricinus* and *Haemaphysalis punctata*, being present. A list of 23 references to the literature is included.

Further studies on the nature of lumbar paralysis in the goat [trans. title], O. EMOTO (*Jour. Japan. Soc. Vet. Sci., 3 (1924), No. 1, pp. 37–68, pl. 1*).—The author finds that a streptococcus is the causal organism of this disease, and gives the name *Streptococcus caprinus* to the organism.

Hog cholera, C. LÓPEZ Y LÓPEZ (*Peste Porcina (Cólera del Cerdo). Madrid: Asoc. Gen. Ganaderos, 1923, pp. 132, pls. 15, fig. 1*).—This is an extended account of hog cholera and means for its control.

The topographical anatomy of the head and neck of the horse, O. C. BRADLEY (*Edinburgh: W. Green & Son, Ltd., 1923, pp. XII+228, figs. 96*).—The plan and aim of this installment of an account of the topographical anatomy of the horse are the same as those on the limbs and on the thorax and the abdomen (E. S. R., 49, p. 787).

Sterility in mares, W. W. DIMOCK and E. A. CASLICK (*Jour. Amer. Vet. Med. Assoc., 65 (1924), No. 2, pp. 141–160*).—This is a contribution from the Kentucky Experiment Station, presented at the annual meeting of the American Veterinary Medical Association, at Montreal, in August, 1923.

Pathological studies in the fowl, B. F. KAUPP and R. S. DEARSTYNE (*Vet. Jour., 80 (1924), No. 586, pp. 153–158, figs. 3*).—This is a contribution from the North Carolina Experiment Station, which deals with a case of impaction of the floating portion of the small intestine of a White Wyandotte hen, an extra abdominal testicle of a Single Comb White Leghorn cockerel, and pyaemia of a Barred Plymouth Rock cock.

Differential diagnosis of poultry diseases and technic of post-mortem examination of the fowl, W. R. HINSHAW (*Vet. Med., 19 (1924), No. 6, pp. 373–376, figs. 4*).—This is a contribution from the department of bacteriology of the Kansas Experiment Station, in which the author has shown that history, symptoms, seasonal distribution, and post-mortem lesions all aid in making a correct diagnosis.

Diseases of the egg-producing organs, W. T. JOHNSON (*Western Washington Sta. Bimo. Bul. 12 (1924), No. 2, pp. 39–43, figs. 2*).—After discussing the normal functioning of the egg-producing organs of poultry, the author deals with abnormal formations, the symptoms, and treatment.

Clostridium botulinum type C associated with a limberneck-like disease in chickens and ducks, R. GRAHAM and I. B. BOUGHTON (*Jour. Amer. Vet. Med. Assoc., 64 (1924), No. 6, pp. 723–727*).—An abstract of Illinois Station Bulletin 246 (E. S. R., 50, p. 383).

Fowl typhoid in Algeria [trans. title], A. DONATIEN, E. PLANTUREUX, and F. LESTOQUARD (*Arch. Inst. Pasteur Algérie, 1 (1923), No. 4, pp. 585–603, figs. 6*).—Fowl typhoid, due to *Bacterium sanguinarium* or *B. gallinarum*, is said to be widespread and of frequent occurrence in Algeria, the infection being disseminated by chronic carriers. Adult fowls of one to two years of age are particularly susceptible. It occurs most frequently in acute and subacute forms, the mortality being very high. The liver, spleen, and intestines all contain lesions, and bacteriological examinations show it to be a septicemia. Vaccination is said to have given some very good results.

RURAL ENGINEERING.

The movement of water in irrigated soils, C. S. SCOFIELD (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 9, pp. 617–694, pls. 2, figs. 13*).—In a contribution from the U. S. D. A. Bureau of Plant Industry, a series of studies are reported on certain aspects of the alkali problem which as a whole relates to the soluble salts in the soil solution.

It is shown that the effective supply of water that may be stored in the soil to last from one irrigation to the next is limited on the one hand by the field-carrying capacity and on the other by the inability of the plants to take water from the soil beyond what is known as the wilting point. The soil may hold as much as 6 in. of water per foot of depth, but ordinarily its net effective storage capacity is not much above 2 in. per foot of depth. The subsoil, which is usually more compact than the surface soil, may become saturated when it contains 5 in. or less per foot, and the addition of 1 in. of water to a saturated subsoil may raise the level of the underground water as much as 1 ft.

When irrigation water is applied to the soil it penetrates in part by flowing into cracks and also by way of the small spaces between the particles of soil. The rate of the penetration of water into a dry soil is influenced not only by the general texture of the soil but even more by the physical reactions of the soil material to water. The addition of water to a dry soil causes a perceptible change in color, so that it is possible in the laboratory to observe and measure the rate of penetration and to establish the fact that the rate of penetration is very different in different soils. In a moist or saturated soil the movement of water may also be measured with a fair degree of accuracy.

The physical condition of the soil is largely the result of chemical reactions that take place between the soil particles and the salts dissolved in the soil solution. The character of the soil solution is a matter of fundamental importance in irrigated farming, not only because of its relation to the plant but also because of its relation to the physical condition of the soil.

Changes in the concentration of the soil solution induce reactions between the solution and the soil and consequently cause changes in the physical condition of the soil. Changes in concentration also result in changing the balance of the solution constituents in relation to each other. The soil solution is continually changing in concentration and in composition, and the soil takes part in these changes through reactions between the basic constituents of the solution and the bases combined with the soil.

The physical condition of the soil, and particularly its permeability to water, is largely influenced by the character of the bases that are combined with the soil. When the alkaline bases, sodium and potassium, predominate, the soil is deflocculated and impermeable. When the earthy bases, calcium and magnesium, are in excess, the soil is flocculated and permeable.

When saline soils are leached to reduce the concentration of the soil solution it is often found that they become impermeable to water. This condition is due to the effect of the alkaline bases combined with the soil, which causes deflocculation to take place when the salts of the strong acids, sulphuric and hydrochloric, are removed from the solution.

Where the subsoil of an irrigated field is saturated with water or contains strata or barriers that are slowly permeable to water, effective leaching of the soil is seriously hindered because of the accumulation of underground water.

The lateral movement of underground water, like the downward movement of water through the soil, is subject to great variation, depending upon local conditions, and the quality and concentration of the solution are also highly variable, even within the same field. The comparison of the quality and concentration of underground waters from different parts of the field with those of the irrigation water permits a better understanding of the drainage requirements of the soil than is possible from observing only the depth to the underground water.

The injurious effects that have been ascribed to sodium carbonate in irrigated soils appear to be due to the sodium rather than to the carbonate, and sodium in solution, even when associated with the stronger acids, combines with the soil and ultimately causes deflocculation and impermeability. The readjustment of the relative proportions of sodium and other bases in an impermeable soil, to the end of improving the physical condition, depends upon replacing the sodium with another base, such as calcium or aluminum, which when combined with the soil brings about a flocculated and permeable condition.

[Irrigation and drainage investigations at the Colorado Station], R. Parshall (*Colorado Sta. Rpt. 1923, pp. 32–35*).—Studies of evaporation within and without the laboratory are said to have shown very similar characteristics, but that the maximum rate does not occur at the same time of day. The effect of wind is very marked on the rate of evaporation.

Studies of the Herschel hollow-crest weir are said to have resulted in certain modifications of this weir which eliminate the hollow crest. A free-flow discharge formula for this weir is presented.

Land clearing projects [at the Duluth, Minn., Substation], M. J. Thompson (*Minnesota Sta., Duluth Substa. Rpt. 1922–1923, pp. 32, 33, fig. 1*).—Data from experiments on a 5-acre tract of burned land showed that the cost was $17.14 per acre for clearing up to the breaking stage. A comparison of horses and tractor power for stumping gave results slightly in favor of the latter.

Terracing farm lands, C. E. Ramser (*U. S. Dept. Agr., Farmers' Bul. 1386 (1924), pp. II+22, figs. 23*).—This is a revision of and supersedes Farmers' Bulletin 997 (E. S. R., 40, p. 188). It gives practical information on the terracing of farm lands. It is stated that the ridged terrace is the best adapted to moderate slopes, while for steep slopes the bench terrace gives the best results.

Volume change a measure of alkali action, D. G. Miller (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 4, pp. 12, 13, 17, figs. 4*).—Studies conducted by the department of agriculture of the University of Minnesota, the Minnesota Department of Drainage and Waters, and the Bureau of Public Roads on the effect of alkali action on concrete, as indicated by changes in length of test specimens, are briefly reported.

The results indicate that any appreciable increase in length of test specimens is indicative of loss of strength, since test cylinders stored in distilled water not only showed no tendency to expand but in many cases slightly contracted. Studies of the relative effects of alkali solutions of different strengths on test cylinders have shown that the destructive effect of a 4 per cent solution is not much greater than of a 1 per cent solution, although for solutions of below 1 per cent the action is approximately proportional to the strength of the solution.

Public Roads, [June, 1924] (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 4, pp. 20, figs. 16*).—This number of this periodical contains the usual data on road material tests and inspection news and status of Federal-aid highway construction as of May 31, 1924, together with the following articles:

The incidence of the Highway Tax Burden, by H. R. Trumbower; Pennsylvania Highway Transport Survey; Volume Change a Measure of Alkali Action, by D. G. Miller (see p. 684); and Observations on the Operation of Material Testing Laboratories, by F. H. Jackson and C. E. Proudley.

Spraying machinery for the cranberry bog, C. S. Beckwith (*New Jersey Stas. Rpt. 1922, pp. 459–461*).—Improvements in spraying machinery for cranberry bogs to prevent injury to the vines are briefly reported.

The New Jersey suburban unit house, W. P. Thorp, jr. (*New Jersey Stas. Rpt. 1922, pp. 172, 173, pl. 1*).—A new type of poultry house for suburban use is briefly described and illustrated.

Double-roller poultry house curtain, G. R. Shoup (*Western Washington Sta. Bimo Bul., 12 (1924), No. 2, pp. 33–39, figs. 2*).—The so-called double-roller poultry house curtain for use on poultry houses in the State of Washington is described and illustrated.

Studies on the biology of sewage disposal, W. Rudolfs et al. (*New Jersey Stas. Bul. 390 (1923), pp. 3–78, figs. 33*).—A series of studies conducted in cooperation with the New Jersey State Department of Health on the biology and biochemistry of sewage disposal are reported. These included chemical, protozoological, botanical, bacteriological, and practical studies.

Studies by F. L. Campbell and Rudolfs on Imhoff tanks at Plainfield, North Plainfield, and Dunellen, N. J., in which attention was centered on sludge digestion, indicated that the contents of sludge digestion chambers are stirred up during operation by increasing gas evolution. For several weeks fresh solids come in faster than they can be digested. Resting allows a tank to catch up in its digestion. Free ammonia determinations on the liquid and sludge of operating and resting tanks showed that the diffusion of ammonia out of the digestion chambers takes place fast enough to account for the greater ammonia content of the effluent over that of the influent. H-ion concentration values showed, however, that the effluent of a tank is always less alkaline than the influent. It is thought that some acid compound must diffuse out of the digestion chambers also. No nitrites or nitrates have as yet been found in liquid or sludge to indicate the presence of nitrifying organisms. Analyses of gases from sludge digestion showed that the gas composition was fairly constant in weekly samples from one gas vent over a 2-month period. No hydrogen was found. Gas collected from sludge alone 17 ft. below the surface of the vent showed less carbon dioxid than samples collected at the surface. The carbon dioxid content decreased from the inlet to the outlet end of a tank.

Studies on chemical changes in three layers of the Plainfield sprinkling filter beds showed that sampling from pipes which tapped the bed was the best method possible without building a special experimental bed, but that the samples were often not representative because the volumes were not constant. The results showed that the greater part of the effective nitrification takes place at the bottom of the bed throughout the whole year. It is believed that old solids which collect at the bottom offer a large active surface for the sewage flowing through them and so are responsible for the nitrification at the bottom. The analogy between these solids and activated sludge is pointed out. Denitrification was found to exceed nitrification in the upper parts of the bed in the spring just before the accumulated solids pass out. Free ammonia was found to be removed chiefly at the bottom of the bed, and ammonia formation in the bed often obscures the decrease in ammonia originally present in the influent as it passes through the bed.

Studies on the fauna of the sprinkling filter bed and Imhoff tanks, by L. A. Hausman, dealt with the numerical and seasonal status of the lower animals present. The results showed that the free-moving forms, such as the freeswimming ciliates and worms, increase in numbers as the film on the stones builds up, and that during the slough these pass out with the filter effluent along with the sloughing film. It is noted that just before sloughing begins the nematodes and annelids begin to increase. The growth of Opercularia, the stalked fixed protozoan form, increases greatly after the sloughing is over and when the film from the stones is removed. It is considered probable that this form may be important with reference to its excretions into the filter bed. A considerable assemblage of organisms was found in the influent and effluent of the Imhoff tanks, and these, together with the wind-blown dust, are considered to be the probable sources of the population in the filter beds.

Studies of the fungi and algae of the sprinkling filter bed, with special reference to their seasonal distribution, by C. M. Haenseler, W. D. Moore, and J. G. Gaines, are also reported. These included an examination of the slimy film on the stones of a sewage filter bed, conducted over a period of 16 months to determine the relative abundance and seasonal fluctuation of fungi, algae, and filamentous bacteria. The surface layer of stones was found to be covered throughout the year with an abundance of a green alga, Stigeoclonium, and the blue-green alga Oscillatoria. A relatively small amount of fungi was present on the surface stones. On the subsurface stones the slimy film was bound together largely by fungi, Beggiatoa, filamentous bacteria, and stalked protozoa. The principal fungi found in the mycelial stage were *Penicillium* sp., *Pythium* sp., Dictyuchus, and two unidentified forms. There was a seasonal fluctuation of the fungi, reaching a maximum during the winter months and a minimum during June, July, and August. Beggiatoa and the filamentous bacteria had a seasonal fluctuation opposite that of the fungi, reaching a maximum during the summer and a minimum during the winter. Fungus hyphae seemed to play an important rôle in building up and binding together the film on the surface stones of the filter bed.

Bacteriological studies on the Imhoff tank and sprinkling filter bed, by M. Hotchkiss, included a survey during the period from November, 1922, to April, 1923, of bacteria responsible for certain biochemical changes. These included proteolytic organisms, organisms responsible for sulphur reduction and oxidation, those concerned with nitrogen transformation, and those causing the destruction of cellulose. The bacterial population of both Imhoff tanks and sprinkling filters was found to be similar during the winter months, and the groups of organisms bore approximately the same numerical relationship. Of the types studied, those present in the highest dilutions of the inoculum were the proteolytic bacteria and the bacteria concerned with the transformation of nitrogen. The nitrate-reducing organisms were somewhat more abundant than the nitrogen-oxidizing organisms in both the sprinkling filter and the Imhoff tank. The bacteria concerned with sulphur changes were less abundant than those concerned with the nitrogen cycle, while cellulose destroyers were found only in the low dilutions. The variation in numbers of nitrogen reducers and oxidizers was the same during the period. In general an inverse ratio existed, with the nitrogen oxidizers present in large numbers at first and then decreasing while the nitrogen reducers increased in numbers during the winter months.

Observations on tanks in the resting condition showed that approximately the same distribution of organisms occurred as in tanks in operation. The length of the incubation period was found to be an indication of the ease with which the different substances were attacked by the bacteria. During the 6-month period bacteria which produce oxidation changes were present in the Imhoff tanks, while those which produce reduction changes were also found in the sprinkling filter. These results are taken to indicate that it is not wholly correct to designate Imhoff tank purification as anaerobic digestion or the sprinkling filter as a purely oxidizing agency.

Plant and laboratory experiments on the initial dewatering of sludge with aluminum sulphate to hasten air-drying on beds, by Rudolfs, J. R. Downes, and Campbell, are also briefly reported.

A list of 21 references to works bearing on the subject is included.

Investigations of sewage problems, R. O. SMITH ET AL. (*New Jersey Stas. Rpt. 1922, pp. 487–535, figs. 7*).—This is an account for the fiscal year 1921–22 of studies presented in the above report.

RURAL ECONOMICS AND SOCIOLOGY.

The real trouble with the farmers, H. QUICK (*Indianapolis: Bobbs-Merrill Co., 1924, pp. [4]+215*).—The author discusses the manner in which duties on agricultural products have affected farmers in the State of Texas, particularly the growers of cotton, corn, wheat, rice, flaxseed, peanuts, wool, cattle, and dairy and livestock products. He alleges certain indirect ill effects of tariff schedules for manufactured articles. The problem of holding farm products off the market is said to be an extremely difficult one, but agencies which would enable the farmers to withhold shipments when conditions through manipulation or transportation disturbances are temporarily bad are to be encouraged. Diversification is recommended, but not as the one solution of farmers' difficulties. The chief evil is said to lie in the unequal distribution of the consumer's dollar. Railway rates under the Esch-Cummins law are held unfair to agriculture. It is suggested that railways and waterways should be developed as one system under the agency of the Government, and Government ownership of railroads is favored. The advantages of cooperation are discussed in considerable detail.

The principal theme, however, is that farm land values are so high and rising at such a rate that only wealthy persons can own land, and that tenancy is increasing at an alarming rate. It is urged that cheap land be provided to workers through the imposition of all taxation on the value of bare land exclusive of improvements. The value of improvements would then measure the purchase price.

[Papers presented before section 3 of the Eleventh International Congress of Agriculture] (*XI^e Congrès International d'Agriculture. Sect. 3, Économie Rurale. Paris: Libr. Agr. Maison Rustique, [1923], pp. 170*).—The following papers were presented before the section on rural economics of the Eleventh International Congress of Agriculture held in Paris May 22–28, 1923: Material and Moral Improvement of the Condition of the Rural Laborer, by P. de Monicault; Agricultural Associations and Their Development, by Vimeux; Offices of Agricultural Account Keeping, by H. Girard; The Regulation of Property Transfers in the Different Countries and the Means of Reducing the Expenses Involved, by A. A. Fould; The Profits and Expenses of Agriculture, by P. Caziot; The Rural Exodus in France, Its Causes and Remedies, by C. Egasse; Agricultural Account Keeping in Great Britain, by A. D. Hall; The Agrarian Reform in Rumania and Its Consequences, and Agricultural Cooperation in Rumania, both by G. I. Sisesti; The Reform of Holdings in Spain, by Viscount de Eza; The Improvement of the Social Condition of Farm Laborers, by Giele; The Social Rôle of Agriculture, by A. Delos; The Effects of the European War upon Spanish Interoceanic Emigration, by S. Crespo; Recent

Efforts toward Home Colonization in Spain, by E. de la Loma y Milego; and The Land Register in Spain, by J. A. de Oteyra.

Rural economics [trans. title] (In *XIe Congrès International d'Agriculture, 1923. Tome II, Compte Rendu des Travaux. Paris: Libr. Agr. Maison Rustique, 1923, pp. 152–191*).—The program and a stenographic report of the discussion of papers noted above are given in these pages. The additional papers printed here but not read are The Agrarian Reform in Hungary, by C. Schandl; Rural Economics in Greece Since the International Congress at Ghent, 1913–1923, by B. Simonide; The Desertion of Rural Districts, by N. Garcia de los Salmones; and The Decrease Since the War in the Production of Sugar Beets and Its Consequences upon the Balance Production in Europe, by A. Chlapowski

The economic resources of the Pacific Northwest, edited by H. T. Lewis and S. I. Miller (*Seattle: Lowman & Hanford Co., 1923, pp. XIV+15–523, pls. 18, figs. 20*).—Among the signed articles assembled in this volume are The Grain Resources of the Northwest, by G. R. Hyslop; Livestock Industry of the Pacific Northwest, by C. W. Hickman; Irrigation in the Northwest, by W. W. Johnston; Small Fruits and Canning, by F. Fellow and O. W. Morris; The Apple Industry, by M. L. Dean; Forestry and Lumbering, by H. Winkenwerder; and Fishing Resources, by J. N. Cobb. Other articles describe mineral and other industrial resources and transportation facilities.

An agricultural program for Montana, A. Atkinson (*Montana Sta. [Pamphlet], 1924, pp. 13*).—Certain essentials of agricultural success in Montana are pointed out. Such general considerations as permanence and individual efficiency, the buying power of farm products, low cost operation, the production of the family living, and efficient marketing are touched upon. Wheat, sugar beets, peas, beans, flax, and apples are described as cash crops. Sweet clover and seed production, as well as the growing of corn and silage, are deemed important. Suggestions are offered with respect to a livestock program and a number of topics bearing upon land settlement are briefly outlined.

This public domain of ours, G. Stewart (*Utah Sta. Circ. 49 (1924), pp. 3–56, figs. 16*).—The history of the acquisition of public land is recounted, and questions of policy with reference to its utilization and disposal are discussed. It is concluded that six methods of handling the public domain are possible, namely, to let it remain as open range with consequent evils, to organize a Federal leasing system, to put it under a Federal permit system somewhat similar to that of the national forests, to turn the land over to the several States and allow them to handle it as each sees fit, to arrange for it to pass gradually into private ownership under such regulations as will aim to control the method of acquirement and the size of ranch, and to further classify the land and handle each sort in such a manner as to permit its fullest ultimate development. The author personally favors land classification and the putting of each sort of land under whichever system promises the fullest ultimate development.

Agricultural economics, A. G. Waller (*New Jersey Stas. Rpt. 1922, pp. 311–314*).—Preliminary summaries of data obtained in 1922 in a tractor and truck survey in Monmouth and Burlington Counties, N. J., are given with comparisons, with similar data for the previous year. The costs of can-house tomato production in 27 farms in 1921 are also tabulated.

A study of an alfalfa crop enterprise upon a commercial dairy farm in New Jersey, C. C. Cook (*New Jersey Stas. Rpt. 1922, pp. 292–305, pl. 1, figs. 4*).—This enterprise is considered from the point of view of the variation of acreage and the yield per acre of alfalfa over the growing period 1911 to 1921.

The cost per acre and per ton is shown, and three stages are defined into which costs are said to fall, namely, the experimental stage (1911–1913), that of normal production (1914–1916), and that of abnormal production (1917–1921). Preparatory costs per ton show a decided rise from normal in 1917, continue it to 1920, and then assume an even steeper incline to 1921. The abnormal condition was said to be not entirely due to war costs, about 17 per cent of the total rise in costs per acre being attributed to local conditions which caused poor production, and which are said to be growing more serious. Variations from the average yield per acre, average acreage, and average cost per acre are computed. Certain possible explanations on the basis of soil conditions are discussed briefly.

Cost of producing pork, E. L. Potter, H. A. Lindgren, and A. W. Oliver (*Oregon Sta. Circ. 56 (1924), pp. 3–12, figs. 3*).—Taking an arbitrary feed cost of 1.5 cts. per pound and a labor cost of 30 cts. an hour, the total cost per litter of 5.5 pigs is calculated as $31.28. The final cost of growing a pig from weaning to maturity or from 30 to 200 lbs. live weight is said to be $12.85, making a total cost of a 200-lb. pig $18.54. Certain considerations in reducing costs are set forth.

Cost of producing milk and butter-fat, R. V. Gunn and N. C. Jamison (*Oreg. Agr. Col. Ext. Bul. 371 (1924), pp. 24, figs. 9*).—A project was conducted in Multnomah, Clackamas, Columbia, and Washington Counties, Oreg., in which survey records were obtained from 120 dairymen in 1920, from 67 of the same ones in 1921, and from 82 in 1922. These surveys were supplemented in part by monthly reports from a number of these dairymen. The results are given here on the herd basis. An average of 90 herds were visited each year, totaling 1,256 cows, or an average of 14 cows to the herd.

The feed cost approximated 60 per cent, labor 30 per cent, and overhead 10 per cent of the total cost of producing dairy products. The labor income per hour varied from 13 to 43 cts. according to production per cow. The labor returns per dollar expended for feeds, including home raised feeds, varied from 77 cts. to $1.18 as the production per cow increased. Seventy-six per cent of all feeds were home raised. Only 16 per cent of all labor was hired labor.

Farm credits in the United States and Canada, J. B. Morman (*New York: Macmillan Co., 1924, pp. XV+406*).—The principal features and practical results of legislative efforts toward providing systems of land mortgage and personal credit for farmers in the United States and Canada are set forth. The two forms of credit are discussed separately. Part 1 comprises 13 chapters on land mortgage credit and part 2 7 chapters dealing with short-time and intermediate credit. The main points kept in mind throughout the discussion are the terms of procuring and continuing such credit and the effect of them upon the farming industry and the social and economic status of farmers.

Farm mortgages not a lien but a support, L. A. Phillips (*Assoc. Life Ins. Pres. Proc., 17 (1923), pp. 137–147*).—The extent to which life insurance companies invest their reserve funds in farm mortgages and the interest rates charged are set forth here.

Agriculture [in Canada] (*Canada Yearbook, 1922–23, pp. 220–309*).—These pages present articles on the history of agriculture in Canada and the relation of the Government to agriculture, together with comparative statistics with interpretative notes covering a period of years up to and including 1923 in some instances. An earlier annual report has been noted (E. S. R., 48, p. 894).

The economic and agricultural organization of Brazil [trans. title], O. Ménabs (*Écon. Franç., 52 (1924), I, No. 16, pp. 483–486*).—Various colonization schemes, means of affording credit for agriculture, agricultural cooperatives, and opportunities for agricultural education and technical aid to agriculture are briefly noted.

Agriculture in the department of the lower Seine, P. Labounoux and G. Jannin (*L'Agriculture dans le Département de la Seine-Inférieure. Rouen: [Serv. Agr. Seine-Inférieure], 1923, pp. 178, pl. 1, figs 70*).—This monograph comprises 12 chapters describing the geography, population, methods of landholding, buildings and equipment, crops and livestock produced, secondary industries associated with agriculture, organizations, and institutions for agricultural education in this region. A report by P. Croisé is included, in which the individual farms awarded prizes in a special contest in 1922 are described.

Interim reports from the select committee on the conditions and prospects of the agricultural industry and methods of improving the same, together with the digest of evidence, index, and appendices (*Sydney: N. S. Wales Legislative Council, 1923, pp. LXVIII+649, pl. 1, figs. 2*).—This is a later volume containing the interim reports noted earlier (E. S. R., 46, p. 694; 49, p. 93) and a digest of the evidence presented to the committee.

Sugar in relation to the tariff, P. G. Wright (*New York and London: McGraw-Hill Book Co., Inc., 1924, pp. XIII+312, pl. 1, figs. 8*).—The three chapters constituting part 1 of this study give briefly a description of the growth and extent of the sugar industry, while the remainder of the volume deals with sugar, historically, economically, and statistically, in its relation to the tariff. This is designed to determine whether sugar should be dutiable, and if so, what principles should determine the rate to be assessed and what the specific rates should be. Incidentally the investigation brings out the relation between the costs of production of sugar and its price and the extent to which the domestic industry is dependent upon the tariff, together with the effect of changes in the tariff upon prices, imports, and the domestic industry.

Findings with reference to costs are summarized in the main conclusions that the majority of the establishments produce at less than the marginal cost, that the marginal costs in all regions of domestic production contributing to the same market tend, after allowing for transportation costs, to become equal to each other and equal to the market price, and that marginal costs tend to adapt themselves to changes in the tariff.

The principal general conclusion is reached that, from the standpoint of both revenue and protection, sugar is a suitable commodity to be subject to a moderate rate of duty. A rate of not less than 1.25 nor more than 1.5 cts. per pound on 96° Cuban centrifugals is suggested as adequate to maintain the present proportions of domestic and foreign sugars in the domestic market.

Country planning, F. A. Waugh (*New York: Harcourt, Brace & Co., 1924, pp. XIV+183, pls. 12, figs. 6*).—The immediate object in country planning is said to be to provide the physical equipment which will best serve the social and economic purposes of country dwellers or visitors there. Chapters in this treatise on the subject discuss the subdivision of land, the road system, road improvement, the individual farm, the farm home, school grounds, the rural cemetery, public grounds, parks and playgrounds, forests and forestry, the native landscape, political relations, maintenance problems, and how to get results. Progress is said to require local initiative, expert advice, time, and money. Local organizations, and a definite program of improvements are deemed essential.

Child labor and the work of mothers on Norfolk truck farms (*U. S. Dept. Labor, Children's Bur. Pub. 130 (1924), pp. IV+27, pl. 1*).—A study of the work of children on truck farms in selected districts in Norfolk and Nansemond Counties, Va., was made during May, June, and July, 1921. An interview was held with every family living or working on farms in which any child under 16 years of age had done farm work during the year preceding the interview. This report deals exclusively with 895 negro children in 502 families. Only 191 children lived on the farms throughout the year and 64 during the busy season. The majority came out to the farms to work during the day, returning to their homes in towns or rural settlements.

Of the 502 families, 25 were those of farm operators, of whom 8 were farm owners and 17 were tenant farmers. Seventy-eight of the families were those of farm laborers living on farms. There were 426 boys and 469 girls among the workers included in this study. The majority of the children at work were under 14 years of age and 235 were under 10.

The children engaged in such work as preparation of the soil, planting and transplanting, the cultivation of crops, and harvesting. It was revealed that 368 of the children had had a working day of less than 6 hours; 245 children had worked between 6 and 8 hours, although 156 of the total number reported that they had spent more than 8 hours in the fields on their last working day and 76 had remained from 10 to 14 hours. Fifteen children under 10 and 57 under 12 years of age had worked more than 8 hours.

More than half of the 452 children reporting their earnings have received less than 10 cts. an hour; 71.7 per cent earned less than 15 cts. an hour; and 95.8 less than 25 cts. Only a minority of the 318 children 8 to 13 years of age had earned as much as 75 cts. a day, though most of them had worked 5 or more hours.

These children were found to have been considerably handicapped educationally, being more retarded in school than any one group of farm workers which has been similarly studied. A large proportion had attended school less than half the school term, and many had been absent from school for farm work for at least one month during the year preceding the inquiry. More than one-fifth were supported by mothers, many of whom were in domestic service, and lack of time and fatigue in the case of these mothers who were away from home were factors along with poverty and ignorance in causing irregular meals and unsuitable dietary.

Costs of family living on the farm, O. R. Johnson (*Missouri Sta. Bul. 213 (1924), pp. 20, figs. 8*).—This is the report on a study of money and other costs of family living in from 20 to 30 Missouri farm homes from 1912 to 1922, inclusive, and on a farm home labor study covering the years 1912 to 1915, inclusive, and with respect to 8 farms. The relation between retail prices, farm labor incomes, and family living costs is analyzed. Maintenance costs and the distribution of cash costs between groceries, clothing, household, and other accounts are shown. The labor demands on the housewife are brought out, and a comparison is made of this and certain other factors between a city home and the rural homes under study.

This investigation indicates that the cost of family living on the farm is less directly influenced by the farmer's labor income than by retail price trends. Cash cost items of living expense made up 61.7 per cent of the total living cost. Products furnished by the farm constituted about one-fifth of the family living and the use of the house 16.58 per cent.

The housewife on the farm worked an average of 11.32 hours per day the year round as compared with 9.64 hours for the farmer. Her week day was 12.09 hours and her Sunday 7.7 hours spent in household duties. She gave 8.17 hours to maintenance, consisting largely of meals and the care of the house, and 3.15 hours to production in the way of sewing and caring for the poultry, garden, and dairy. She is said to have given nearly 2 hours per day to outdoor labor, principally in the months of May and June. The city housewife gave much less time to meals, about the same time to the care of the house, sewing, gardening, marketing, and personal affairs, and more time to the care of her children and recreation.

The cost of living in rural communities in Sweden in 1920, G. Huss et al. (*Levnadskostnaderna på Landsbygden i Sverige vid år 1920. Stockholm: K. Socialstyrelsen, 1923, pp. 143+71*).—Tabulations giving the principal commodities for which wages were expended, comparing the quantities of different foods consumed and the amounts spent on clothing by the different classes of agricultural workers; the receipts and expenses of laborers, tenants, and others; and the prices paid for specific food commodities in different sections of the country are drawn up here and the returns discussed.

Crops and Markets [June, 1924] (*U. S. Dept. Agr., Crops and Markets, 1 (1924), Nos. 23, pp. 353–368; 24, pp. 369–384; 25, pp. 385–400, fig. 1; 26, pp. 401–416*).—The usual abstracts of current weekly market information, notes on the position in the market of important classes of crops and livestock, tabulated weekly receipts and prices with summaries and comparisons, brief notes on foreign crops and markets, and miscellaneous brief special articles are presented in these numbers.

Monthly Supplement to Crops and Markets [June, 1924] (*U. S. Dept. Agr., Crops and Markets, 1 (1924), Sup. 6, pp. 169–208, figs. 5*).—Several special reports are presented in this number, summarizing a large number of reports from farmers in regard to the cost of producing field crops, 1923, and reporting the gross value of many crops per acre as showing the most severe effects of the deflation period in 1921 and the partial recovery in 1922, also the sale prices of purebred animals in 1922 and 1923 and the production of manufactured dairy products in 1923 by months and by States. The apple market season of 1923 is described. In addition this number offers current and comparative estimates of crop condition on June 1, the usual estimates of acreage and production of specified crops, farm prices, cold-storage holdings, the receipts and disposition of livestock and meat in April and May, carload shipments of fruits and vegetables, grain receipts, and miscellaneous notes.

A contribution to the study of our production and commerce, J. Aguilera (*Contribución al Estudio de Nuestra Producción y Comercio. Barcelona: Cámara Oficial de Industria, 1923, pp. [6], pls. 8*).—Graphs are presented with interpretative notes setting forth the total imports and exports of Spain, the trade in raw materials, manufactured goods, and foodstuffs, and agricultural products exported from 1882 to 1921; also the production, value, and average prices of various commodities from 1891 to 1921 and the wine production in France compared with the exports of wine from Spain from 1882 to 1921, inclusive.

The production of cereals in France [trans. title], E. Payen (*Écon. Franç., 52 (1924), I, No. 21, pp. 643–645*).—Statistics published by the French Ministry of Agriculture comparing the area sown May 1, 1923 and 1924, are briefly reviewed, as are also data covering the production of grains through a number of years.

[Agricultural statistics of British India, 1911–12 to 1920–21] (*Brit. India Statis. Abs., 56 (1912–1921), pp. 340–357*).—These pages present statistics for later years, continuing those previously noted (E. S. R., 48, p. 894).

AGRICULTURAL EDUCATION

Effectiveness of vocational education in agriculture, C. E. MYERS (*Fed. Bd. Vocat. Ed. Bul. 82* (*1923*), *pp. V+63, figs. 11*).—A report is made upon data collected in 1921 from 722 schools in 35 States in an effort to learn what occupations were followed by students who had received vocational instruction in agriculture. and other relevant facts.

Previous to 1918 very few students had left school with training in vocational agriculture. By 1918, 28 of the 35 States participating in this study were sending out students instructed in vocational agriculture, and in 1920 and 1921 all 35 States were doing so. Of 8,340 individuals reported out of school with one or more years of vocational instruction in agriculture, 4,488 were reported as now farming, 48.3 per cent of whom were reported as partners, 29.4 as laborers, 9.5 as owners, 7.2 as renters, and 5.6 per cent as managers. Of the 15 per cent now in occupations other than farming, teachers and clerks led the list, but practically all of the teachers are rural teachers. The miscellaneous factors affecting the farming status of former students of vocational agriculture are discussed in considerable detail, and tendencies in the development of vocational instruction in agriculture are pointed out.

Data from 271 rural high schools in the State of New York representing over 2,350 high school graduates who had not studied vocational agriculture are cited to the effect that only 3.6 per cent of the number are now engaged in farming. In the same survey it was found that 45.2 per cent of the graduates from the vocational courses in agriculture are now farming. Similar information from 23 communities in Pennsylvania where vocational agriculture is taught is also noted, and the conclusion is drawn that if farmers with a secondary education are to be secured to man the farms the rural secondary schools must offer vocational instruction in agriculture.

Detailed statistical material is given in the appendix.

Essentials of the new agriculture, H. J. WATERS (*Boston and London: Ginn & Co., 1924, pp. VIII+549, pls. 6, figs. 357*).—This text has been prepared with the purpose in mind of teaching the student the opportunities in farming and giving him an understanding of the forces with which he must deal to be successful in the management of the soil and in the growing of crops and livestock. Of the 37 chapters, 15 deal with crops, 8 with farm animals, and the remaining 14 with management and economic questions and with such special topics as potatoes, the fruit crop, and the home garden.

A textbook of general botany, G. M. SMITH ET AL. (*New York: Macmillan Co., 1924, pp. X+409, pls. 6, figs. 322*).—A textbook for the teaching of elementary botany is presented by members of the faculty of the University of Wisconsin. The subject matter is arranged for a continuous year's course, but suggestions are made for omitting certain chapters and portions of chapters in case it is necessary to offer a briefer course.

Outline for study of lumber operations, N. C. BROWN (*N. Y. State Col. Forestry, Syracuse Univ., Circ. 40* (*1923*), *pp. 33*).—A logging study outline occupies about 12 pages of this publication. Some practical suggestions covering the form of reports, shop practice, and saw fitting are drawn up, and tables for lumber computations are given.

Report of committee on marketing education, A. LEITCH (*Sci. Agr., 4* (*1924*), *No. 11, pp. 350, 351*).—The field to be covered in marketing courses is briefly dealt with here. It is held that marketing education must give an understanding of the mechanism of assembling, storing, processing, packaging, financing, and the ultimate distribution of specific commodities, as well as the ways and means of improving the present marketing system by standardization, uniformity of rate of supply and of quality. It must include also a consideration of the science and art of cooperation. An appreciation of the principles underlying contracts, credit, competition, monopoly, legal restrictions, property rights, and the theory of value and price is necessary. To this end courses in political economy or economic theory should be basic courses to marketing rather than cultural and general.

An educational effort at an agricultural show, A. ALLSEBROOK (*Jour. Min. Agr. [Gt. Brit.], 31 (1924), No. 2, pp. 161–166*).—An account is given of the provision made to have children from schools in the neighborhood of Malvern, England, attend a local agricultural show as an experiment in education.

School-community fairs, J. T. WHEELER (*Ga. Agr. Col. Bul. 295 (1924), pp. 46, figs. 26*).—Constructive suggestions are given for successfully organizing and carrying out a school community fair in rural districts. The text is abundantly illustrated.

MISCELLANEOUS.

The Bureau of Animal Industry of the United States Department of Agriculture: Its establishment, achievements, and current activities, U. G. HOUCK (*Washington: Author, 1924, pp. XVIII+390, figs. 5*).—This historical account is discussed editorially on page 601.

The Thirty-sixth Annual Report of the Colorado Agricultural Experiment Station for the Year 1923, C. P. GILLETTE ET AL. (*Colorado Sta. Rpt. 1923, pp. 40*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1923, a report of the director on the work of the station, and departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

Biennial Reports of the [Connecticut] Storrs Agricultural Experiment Station [1920–1923], E. H. JENKINS ET AL. (*Connecticut Storrs Sta. Bien. Rpts. 1920–1923, pp. XIII+323, figs. 19*).—This contains the organization list, a financial statement for the fiscal years ended June 30, 1920, 1921, 1922, and 1923, a report of the director, and reprints of Bulletins 105–115, previously noted.

Report of Northeast Demonstration Farm and Experiment Station, Duluth, 1922 and 1923, M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1922–1923, pp. 36, figs. 9*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-third Annual Report of the New Jersey State Agricultural Experiment Station and the Thirty-fifth Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1922, J. G. LIPMAN ET AL. (*New Jersey Stas. Rpt. 1922, pp. XXIX+600, pls. 38, figs. 27*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1922, a report of the director on the work and publication of the year, and departmental reports, the experimental features of which, not previously reported, are for the most part abstracted elsewhere in this issue. An extensive report of the division of extension in agriculture and home economics, containing considerable data pertaining to demonstration work, is also included (pp. 195–277).

Bi-monthly Bulletin [of the Western Washington Station, July, 1924] (*Western Washington Sta. Bimo. Bul. 12 (1924), No. 2, pp. 25–51, figs. 9*).—In addition to articles abstracted elsewhere in this issue, this number contains a brief article entitled Handling Berries for Greater Profits, by H. D. Locklin.

NOTES.

California University and Station.—C. B. Hutchison, director of the Davis branch of the College of Agriculture, has resigned to take up work with the International Education Board, joining Dean Mann of Cornell University in Rome during October. His ultimate headquarters are expected to be in Paris.

Robert W. Hodgson, farm adviser of Los Angeles County, has been appointed associate professor in the division of subtropical horticulture.

Connecticut Stations.—A laboratory for soil investigations is being equipped at the State Station, a greenhouse being included. Willis R. Hunt has been appointed graduate assistant in botany to give special attention to diseases of vegetable crops.

A greenhouse is under construction at the Tobacco Substation at Windsor.

At the Storrs Station a new wing is being added to the dairy barn. This will provide space for 50 head of cattle and will be used chiefly in an attempt to build up the abortion-free herd as a part of the investigations in infectious abortion. Dr. J. G. McAlpine has been appointed assistant in the department of animal diseases and Dr. Walter Landauer graduate assistant in research in poultry genetics.

Idaho University.—Hobart Beresford has been appointed instructor in agricultural engineering.

Massachusetts College and Station.—The Goessmann Chemical Laboratory was dedicated October 3, the speakers including Dr. J. B. Lindsey of the department of chemistry; Dr. C. A. Browne, chief of the U. S. D. A. Bureau of Chemistry; and Dr. T. M. Carpenter of the Nutrition Research Laboratory of the Carnegie Institution. The laboratory is a 3-story brick structure, 195 ft. in length, and costing about $300,000.

The station department of plant and animal chemistry has changed its quarters to the new laboratory, thus obtaining greatly increased and improved facilities. The old station laboratory will continue to be used, partly for control work on feeds and fertilizers and partly for the conduct of routine analytical work in association with the various research projects of the station.

Oliver S. Flint, for the past five years engaged in the campaign for the elimination of bacillary white diarrhea in poultry, has resigned to enter the service of the Massachusetts Certified Poultry Association. This association will work very closely with the station in an endeavor to develop centers for disease-free breeding flocks from which day-old chicks and hatching stock may be sent to commercial poultry farms of the State. Miss Hazel Parker, analyst in poultry disease elimination work, has also resigned.

The Market Garden Field Station, work at which was initiated in 1918 at North Lexington, has been moved to the farm in Waltham given to the college under the will of the late Miss Cornelia Warren. This station will be the center for research in vegetable production and likewise for extension work in the same subject.

The entering class of the college numbers about 1[illegible] per cent increase over the previous year.

Dr. J. F. Novitski, professor of rural sociology, has been appointed head of the new department of rural education at the Oshkosh (Wis.) State Normal School.

Roland H. Verbeck has been appointed director of short courses vice John Phelan, whose resignation has been previously noted. Other appointments include Dr. J. W. Patton as assistant professor of poultry husbandry, W. P. Jones as instructor in agronomy, and Dr. J. B. Nelson as instructor in microbiology. F. E. Cole has resigned as extension specialist in pomology.

Minnesota University and Station.—Investigations have just been initiated by the division of agronomy and farm management in cooperation with the hay, grain, and seeds division of the U. S. D. A. Bureau of Agricultural Economics and the State Railway and Warehouse Commission in the growing of wild hay with a view to giving a basis for the establishment of market grades. F. H. Steinmetz has been appointed special investigator on this problem and will spend some time in studying the species and varieties of grasses found in the wild hay meadows of the State. A sorting laboratory will be established at University Farm, where samples of hay may be studied when cured.

Dr. H. H. Knight, assistant professor of entomology and assistant in parasitology, has accepted an appointment as assistant professor of entomology at the Iowa College. W. B. Combs, professor of dairy husbandry in the Pennsylvania College and Station, has been appointed assistant professor of dairy husbandry and in charge of dairy products, vice J. R. Keithley.

Mississippi College and Station.—A number of readjustments of college and station duties have become effective. J. C. C. Price, associate professor of horticulture and station horticulturist, will henceforth devote his entire attention to station work. George S. Templeton, head of the animal husbandry department of the station, will also serve as head of this department of the college. C. J. Goodell, associate professor of agricultural economics and assistant agricultural economist, has been appointed associate professor of animal husbandry. Earle P. Brintnall, associate dairy husbandman, is no longer connected with the station.

Missouri University and Station.—D. H. Nelson has resigned as instructor in dairy husbandry to accept a position at the University of California. Richard J. Kuhns has been appointed assistant in dairy manufactures and E. C. Elting and C. W. Weber assistants in dairy husbandry. S. F. Russell has been appointed extension assistant professor of animal husbandry.

New Hampshire Station.—A study of food production and consumption in Cheshire County is being initiated in cooperation with the U. S. D. A. Bureau of Agricultural Economics. This county is centrally located for New England as a whole, and is peculiarly favorable for study since comparatively little of the imported food is reshipped to other sections. The study is the first of its kind made in New England.

Eight additional sheep from the experimental flock of the late Dr. Alexander Graham Bell have been presented by his estate to the station. This makes a total of 14 of the Bell sheep now at Durham. They are the product of 30 years' work on the part of Doctor Bell to produce sheep of an unusually prolific strain and with four to six functional nipples instead of two. The animals will be used in the Adams Fund sheep breeding project, under which different breeds have been crossed with a view to determining the closeness with which the characters of hybrids are fixed.

Dr. H. R. Kra[illegible]mist, has resigned to accept a position as biochemist at the Boyce Tho[illegible]stitute, Yonkers, N. Y.

New Mexico College and Station.—The horticultural farm has been enlarged by the purchase of an adjoining tract of 11 acres. The increased facilities are to be used principally for experimental work with peaches, cantaloups, onions, and small fruits.

R. F. Crawford, assistant professor of biology, has been appointed professor of biology vice Dr. Robert Middlebrook, resigned. Paul M. Gilmer, Ph. D., has been appointed assistant biologist, beginning September 1.

J. L. Lantow resumed his duties as professor of animal husbandry July 1 after a year's leave of absence at the University of Illinois. H. V. Jordan has been appointed assistant professor of agronomy vice C. E. Craig, resigned, effective September 1. A. J. Pinckney has been appointed assistant chemist, effective September 1, vice H. L. Wilkins, resigned.

Cornell University and Station.—W. M. Wilson, M. D., head of the department of meteorology, and T. J. McInerney, assistant professor of dairy husbandry, have been granted sabbatical leave for the first semester. Everett F. Phillips, Ph. D., of the U. S. D. A. Bureau of Entomology, has been appointed professor of apiculture, and Ivan C. Hall, Ph. D., professor of bacteriology in the department of dairy industry.

J. Nelson Spaeth has been appointed research assistant in forestry, beginning September 27. It is expected that he will conduct growth studies of the different woods in various localities and develop a series of sample plats.

Ohio State University and Station.—Director H. C. Ramsower of the extension service of the university has been granted a year's leave of absence for graduate work at Harvard University in modern educational methods and their application to extension teaching. Dean Alfred Vivian will be in charge of extension work during his absence.

Joseph F. Barker, professor of agricultural chemistry and soils and extension specialist from 1917 to 1920, died August 25 at the age of 39 years.

In the station, R. C. Thomas, associate in plant pathology, C. H. Hunt, assistant in animal nutrition, and L. D. Baver, assistant in soils, have been granted leave of absence for graduate work at the university.

Rhode Island Station.—Robert L. Jones, assistant chemist, has resigned to accept a position in the Iowa College.

Washington Station.—The station divisions of entomology and chemistry have been studying oil sprays in a joint Adams Fund project during the past year and have worked out a simple method of making a miscible oil. The preparation, which in the tests has been termed the W. S. C. spray oil, is an oil solution which is ready for use merely upon mixing the oil with the emulsifier. It is a cold mix oil involving no boiling, expensive equipment, nor pumping or churning of the stock, and it is claimed that it can be made much more cheaply than any oil spray now on the market. A bulletin describing the oil is now in press.

In 1918, 168 F_3 families of Turkey×Florence wheat were produced at the station under conditions favoring maximum infection to bunt. Of these 72 families showed no trace of the disease at harvest time while the remaining families varied from a trace to 85 per cent of bunted heads. Selections were made from the most promising of the immune families and continued from year to year. The selection that has shown immunity combined with the largest number of other desirable characteristics from the F_4 to F_9 generation has been named Ridit. In yield and quality it is considered as good as the best winter wheats, and it has therefore been increased and sold to farmers. In 1924, 120 farmers received lots of 2 bu. each, an[illegible] have been distributed in larger amounts to about 25 others. Altoge[illegible]is estimated that there are now between 800 and 1,000 bu. in existence, and at the present rate of increase it is thought there should be enough seed to supply all demands by the harvest season of 1926.

Wisconsin University and Station.—The main entrance to the agricultural college campus has been regraded and embellished, completing the quadrangle which constitutes the main approach to Agricultural Hall. This quadrangle has been named the Henry Quadrangle.

To meet the demand for a suitable machine to test the pulling power of horses, as well as their willingness to exert themselves and the ability of the driver in handling his team, a horse dynamometer has been constructed by the agricultural engineering department. The device consists of a running gear to which the mechanism for providing the constant load is attached. The team is hitched to the machine in the ordinary way, and as it starts to pull weights are raised and a valve in a rotary force pump opens, allowing the machine to move forward. The balance is maintained between the weights and the pump so that the same pull is required to keep the machine in motion as it took to start it. The draft remains the same regardless of the type of road or grade, and it may be set at any pull desired.

Wyoming University and Station.—E. R. Schierz, Ph. D., has been relieved of his duties as assistant research chemist in the station in order to devote full time to instruction in chemistry in the university.

Additional Funds for Agricultural Education and Research in Great Britain.—An additional grant of £500,000 to the Development Fund has been arranged. Payments are to be made as required, and it is expected will be spread over the next five years. Among the projects contemplated with the new funds are the extension of foot-and-mouth disease research; the strengthening of the investigations in rural economics, veterinary education, and research; soil surveys; vegetable testing; the provision of additional advisory officers and the stationing of milk analysts at each of the agricultural colleges; and the development of the National Institute of Agricultural Botany.

Haitian Experiment Station.—According to a letter recently received from E. O. Fippin, director of this station since June 1, a tract of about 200 acres near Port-au-Prince is being cleared for development as an experimental farm and instructional headquarters. The soil is a typical dark alluvium, ranging from silt to heavy clay and on the whole quite uniform. The primary problem is that of water supply, recourse to pumping from 30- to 40-foot depths being necessary. Another handicap to rapid progress is the small size of parcels of land and the confused state of land titles.

Plans are being drawn for a main administration and laboratory building and a set of farm buildings, and it is expected that construction will be begun very shortly.

Philippine College of Agriculture.—The first Laguna provincial fair was held on the college campus in May. The college exhibits were quite extensive and attracted much attention. The departments of botany, agronomy, pomology, plant pathology, rural economics, animal husbandry, entomology, rural engineering, veterinary medicine, and forestry were all represented by illustrative material. The college buildings and grounds were also open for inspection, and in spite of unfavorable weather conditions the occasion served to bring the work of the institution quite prominently before the people of the region.

Experimental work in Sind, India.—In anticipation of the prospective irrigation of a large acreage from the Lloyd Barrage at Sukkur in about six years, preparations are [illegible] made to utilize this water to the best advantage through the imme[illegible] commencement of experimental work along lines suggested by the director of agriculture of the Bombay Presidency. Three main stations are being planned, one of which is an extension of one already located at Larkana on the right bank of the Indus River on the Quetta division of the North Western Railway. A second station is contemplated on the left bank of the Indus, probably at Sakrand near Nawabshah, a site on the Lahore division of the North Western Railway. The third station has not been definitely located, but it is expected that it will serve the districts south of Sakrand and east of Hyderabad.

About 400 acres are expected to be required for the three stations at a cost of about $17,300 and with an estimated total outlay, including buildings and equipment, of about $250,000. Numerous substations are also contemplated.

Among the special lines of work which it is hoped to undertake are studies of the duty of water and its most economical method of application, crop rotations, methods of guarding against alkali, and the relative desirability of cultivation by cattle and machinery.

Work somewhat similar to that of the proposed stations is already being conducted on the Government Wheat Farm at Jacobabad on the Upper Sind frontier. The purpose of this farm is to demonstrate cultural methods for wheat and the use of machinery. Motor tractors, drills, and machines for planting and grinding the grain are being demonstrated at present, and threshing and reaping machines are expected in the near future. It is reported that the experiments show that the machinery is far more economical in the long run than the old methods in spite of its cost and the cheapness of native labor.

Plans are also under consideration for establishing an agricultural college in the region, probably at Nawabshah, as well as the development of extension work through agricultural exhibits, tours, and other means.

Necrology.—William D. Hurd, widely known as a leader in various phases of agricultural education, died at Washington, D. C., August 22. Professor Hurd was born in Michigan December 19, 1875. He was graduated from the Michigan College in 1899 and received the master's degree in 1908. He served as professor of horticulture in the School of Agriculture and Horticulture at Briarcliff Manor, N. Y., from 1901 to 1903, as professor of agriculture in the University of Maine from 1903 to 1906, as dean of the College of Agriculture in the same university from 1906 to 1909, and as the first director of extension in the Massachusetts College from 1909 to 1919. During the war he was appointed a special assistant to the Secretary of Agriculture. Since 1919 he had been associated with the soil improvement committee of the National Fertilizer Association, serving as director of this organization since 1920. He was a fellow of the American Association for the Advancement of Science and a member of numerous other scientific and educational bodies.

Bernard H. Rawl, associated with the work in dairying of the U. S. Department of Agriculture from 1905 to 1921, much of this time as chief of the Dairy Division, and also assistant chief of the Bureau of Animal Industry from 1918 to 1921, died at Berkeley, Calif., September 24 at the age of 48 years. He was a native of South Carolina, graduating from Clemson College in 1900 and serving there as instructor in animal husbandry and dairying from 1902 to 1905. Since leaving the Department he had been engaged in commercial dairy work in California. Among his outstanding accomplishments with the Department were the development of dairying in the South in close cooperation with the States and the establishment of the dairy farm at Beltsville, Md., and the experimental creamery at Grove City, Pa.

Association of Official Agricultural Chemists.—The annual convention of this association was held October 20–22 at Washington, D. C., and was of special interest as commemorating the fortieth anniversary of the founding of the association and the eightieth birthday of its honorary president, H. W. Wiley. In recognition of these anniversaries, the presidential address by R. E. Doolittle on The Needs of Our Association dealt largely with the history of the association and its organization, policies, and outlook, and that of the honorary president with the history of the teaching of chemistry in this country, particularly the development of the laboratory method. In the absence of the Secretary of Agriculture, C. A. Browne, Chief of the Bureau of Chemistry, U. S. D. A., spoke briefly at the general session, congratulating the association upon its achievements and particularly the work of its president in editing the Official Methods.

At the regular sessions the customary reports of the referees and associate referees were given, together with the following papers: The Effect of Temperature and Diminished Pressure on the Determination of Moisture in Feeding Stuffs, by L. E. Bopst, A. L. Flenner, and O. H. Reinmuth; Preliminary Notes on the Determination of Moisture, by G. L. Bidwell and W. F. Sterling; The Determination of Available Nitrogen by the Official Neutral Permanganate Method as Used in Florida, by G. Hart; Modification of the Official Lindo-Gladding Method for Potash in Fertilizers, by C. M. Bible; Moisture in Crude Drugs, by J. F. Clevenger and R. C. Capen; Bio-assay of Drugs, by J. C. Munch; Melting Points, by J. F. Clevenger; and Methods of Analysis for Meat and Meat Products, by W. C. Powick.

Following the custom established the previous year, the committee on definition of terms and interpretation of results of fertilizers met in open session before the presentation of its annual report, thus affording opportunity of exchange of opinions between members of the association and representatives of the fertilizer industries.

The reports of the various committees were given at the final session. Of particular interest was the announcement of R. W. Balcom, chairman of the board of editors of the Journal, that the deficit of a number of years had been removed and that this publication is now self-supporting. R. E. Doolittle, chairman of the committee on editing methods of analysis, reported that the revised edition of the Official Methods would be available by the end of January, 1925. The committee on bibliography, appointed at the previous meeting to consider the question of the advisability of including a bibliography in the revision, recommended through its chairman, W. W. Skinner, that arrangements be made to publish in the Journal from time to time reviews on certain subjects with complete bibliographies, but that no bibliography be included in the Official Methods. This motion was approved by the executive committee and adopted by the association. W. F. Hand, chairman of a committee appointed to consider the advisability of studying methods for the analysis of paint, presented arguments in favor of enlarging the scope of the work of the association to this extent, and after considerable discussion it was voted that the committee be continued for the purpose of a further study of the question and that a conference to discuss the subject be held at the following meeting.

The officers of the association elected for the coming year are as follows: President, C. A. Browne; vice president, H. D. Haskins; secretary-treasurer, W. W. Skinner; additional members of the executive committee, W. W. Randall and W. H. MacIntire.

In closing, resolutions were adopted on the death of four members of the association, W. A. Withers, W. C. Stubbs, R. W. Hilts, and A. W. Ogden.

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EXPERIMENT STATION RECORD.

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The death on October 25 of Henry C. Wallace, seventh Secretary of Agriculture, will be deeply regretted by all who are interested in the betterment of American agriculture, and in special measure by those who are engaged in the development of agricultural education and research. It has stricken at his post an able executive, a conscientious counselor, and an earnest and sympathetic leader. Terminating somewhat unexpectedly a sickness of several weeks' duration, it has brought abruptly to a close an efficient and dependable stewardship of the Federal Department of Agriculture, extending over nearly four years of unusual difficulty and responsibility. It has ended in his fifty-ninth year a life of faithful and honorable accomplishment and of seemingly large promise of useful achievement for many years to come.

The various stages of Secretary Wallace's career are readily recounted. Born at Rock Island, Ill., on May 11, 1866, his boyhood was spent on a pioneer Iowa farm. When 19 years of age he entered the Iowa State College, but after two years was obliged to discontinue his course and spend the following five years in farming. Largely because of the advice of Dean W. A. Henry of Wisconsin, he then returned to college, completed his course in a single year, and for a time served as assistant professor of agriculture in charge of dairying, working directly under Prof. James Wilson, afterward Secretary of Agriculture for 16 years. In 1895 he joined with other members of his family in establishing the agricultural journal later known as *Wallaces' Farmer*. Upon the death of his father, Henry Wallace, he became editor of this publication and directed its activities until his appointment as Secretary of Agriculture in 1921.

Although without previous experience in high public office, his training and experience was such as to render him unusually well qualified to understand and sympathize with the viewpoint of American agriculture. In the words of Assistant Secretary Gore, who became automatically Acting Secretary of Agriculture upon his death, and subsequently was appointed his successor, "Secretary Wallace thought of the American farmer in terms of a higher standard of life, from the standpoint of individual opportunity, education, and business prosperity. The tired bodies and aching limbs of those who endured the hardships and inconveniences of life upon the farm were matters of deep concern to him. He was ever zealous in seeking to devise ways and means that would lighten the tasks of those who produced the food and raiment of the land, and to give to every farmer in this Nation the benefits of the discoveries of modern science and to enlarge the possibilities of unexplored fields for his upbuilding. He sought to open to every boy and girl on the farm a wider and more attractive opportunity for service to their country in the production of the necessities of life, and in a better equipped citizenship in its broadest sense."

His work as Secretary has been fittingly characterized by President Coolidge as follows: "Coming from private life to the post of Secretary of Agriculture at a time in which its administration was surrounded by acute and unprecedented difficulties, he brought a particularly effective equipment of wisdom, industry, and executive capacity. Through their unsparing application he achieved a splendid series of successes in behalf of the restoration and rehabilitation of this supremely important national interest. His work has won for him the unstinted confidence of all citizens, as his high character and appealing personal qualities gained for him the affection of all who enjoyed the privilege of intimacy with him."

Taking office as he did in the midst of what he himself termed "the most severe agricultural depression we have ever experienced," it was well-nigh inevitable that the new Secretary's attention should have been directed immediately to the economic phases of agriculture. In a letter to the Association of Land-Grant Colleges at its 1921 meeting, he expressed himself as believing that when the existing period of severe stress had passed away there would be a new era in agriculture in the United States, and one which would present for solution new problems of vast importance. Although in the past the Department of Agriculture, the agricultural colleges and experiment stations, the agricultural press, and indeed all of the agencies which try to serve agriculture, had placed the greatest emphasis upon production and the improvement of production methods, he maintained that the time had come when there should be equal emphasis upon economic questions, marketing, the intelligent adjustment of production to the needs of consumption, an improved system of credit adjusted to the peculiar needs of the farmer, and similar problems. As he put it, "I do not mean to suggest that there should be any lessening in our efforts to increase production, and especially to cheapen production costs, but I would add to these efforts equal attention to what I may call the business side of agriculture."

One of his earliest undertakings was the reorganization of the work of the department pertaining to rural economics. This step was instituted by the early appointment of an economic council and culminated in the formal consolidation on July 1, 1922, of the Bureau of Markets, the Bureau of Crop Estimates, and the Office of Farm Management and Farm Economics into the Bureau of Agricultural Economics. The work was further strengthened by relatively large increases in appropriations and a corresponding expansion in the new bureau's activities.

The betterment of conditions in the rural home was another movement in which he was greatly interested. He was largely instrumental in the establishment of the Bureau of Home Economics as a distinctive organization and with a woman of technical training and broad experience at its head. Such an organization he believed to be greatly needed if the department was to meet adequately its responsibilities for service to the women of rural communities and the Nation as a whole.

The constantly widening sphere of the department's work, and especially the manifold administrative and regulatory duties imposed upon the Secretary of Agriculture by recent legislation, are rendering more and more difficult the intimate personal contact with individuals and details so characteristic in its earlier history. None the less, Secretary Wallace was keenly interested in the progress of the department and sympathetic with its needs. One of the most important innovations of his term of office was the more complete coordination of its work through the appointment of directors of scientific, extension, and regulatory work. Another change in departmental policy of much interest from the standpoint of research was in the active encouragement of graduate work by the members of the department's staff and the offering of courses for the benefit of employees unable to leave Washington for advanced instruction.

He was a stanch believer in the conservation of our national resources and in the efficacy of the Department of Agriculture as an agency for its practical accomplishment. He construed broadly the field which the department should occupy and labored zealously for its upbuilding and development as a means of promoting the general welfare. In so doing, however, while he believed that every advancement of rural life was beneficial and strengthening to the country as a whole, he was in no sense a mere farmers' advocate. As Secretary Gore has said, he carried on the activities of the department in a manner that not only fostered and promoted the interests of the farmer but increased the confidence of all classes of citizens in the justice and high purposes of the Government.

The attitude of Secretary Wallace, the first alumnus of an agricultural college to occupy a Cabinet position, toward the land-grant institutions as a group was notably cordial and appreciative. In their councils he was an active and persistent advocate of the development of economic instruction as the outstanding need of the times. In his 1923 address to the Association of Land-Grant Colleges at Chicago he expressed the view that production, upon which emphasis and effort had been so largely focused, is only a part of successful agriculture. Under the conditions prevailing, he believed the adjustment of production to probable need, the marketing of the products, and a knowledge of economics in general and of economics as they particularly affect agriculture to be even more necessary than the knowledge of production itself, and the preparation of trained men to deal with these matters the outstanding duty of the colleges.

Coupled with this was a firm belief in the duty of these institutions, and of the department as well, to provide intelligent leadership. In the same Chicago address he declared that of late there had been "a great confusion of tongues, with very few clear notes. I do not know," he said, "why the colleges of agriculture and the Department of Agriculture should not take an intelligent interest in an economic condition of this sort, which affects such a large group of our farmers, and more than that, which affects our industry, our commerce, and our labor. I do not know why the colleges of agriculture in their instruction of the young people that come to them, and the Department of Agriculture in its work, should not give the same attention to these larger economic problems that we now give to the problem of production. I think we should. I think if we are going to discharge our responsibility to the people of the United States and to the farmers of the United States we have got to make ourselves a part of agriculture."

That he regarded the stations as copartners with the department in a vast national enterprise of rural betterment is further brought out in a passage from one of his early reports in which he discusses the authorization by Congress of a director of scientific work for the department. This action he regarded as very wise, because it would make it possible still further to coordinate the work of the various bureaus, and also to bring the scientific work of the department into closer relation with the scientific work being carried on in the experiment stations of the different States, as well as to cooperate with various other agencies engaged in similar or related lines of investigation. Such cooperation, he believed, would result in a well-rounded national program of research, a larger and better directed program than in the past, and a much better utilization of both time and money.

He went on to urge the need for strengthening the work of the stations by increased Federal appropriations, stating that it is of the utmost importance that the research service be so maintained as to adequately meet the demands for information. How fully he visualized the fundamental importance of research may be indicated by his statement that the basic work of the department is that of research. "For the first 40 years," he declared, "its chief business was in this field. A staff of scientific specialists was built up who made studies of the soil, of plant cultural methods, of the breeding and feeding of animals, of plant and animal diseases—of everything which had to do with crop and livestock production. It is this scientific research which contributes the material that little by little is crystallized into agricultural progress. . . . It is impossible to estimate the value of this research work. The money spent for it is capital invested by the Nation in building a permanent agriculture."

For these and many other reasons the death of Secretary Wallace will be widely mourned. A true friend of American agriculture in its broadest and fullest sense, he ably and effectively championed its cause in its hour of need and in so doing rendered great service to the Nation.

Although much has been written and more has been said regarding the qualities and the spirit of research, the provision of formal instruction in this field seems to have received comparatively little attention. Indeed it has sometimes been contended that this subject was outside the range of teaching, was governed by qualities purely individual, and that little relating to it could be imparted directly except as absorbed by contact and experience. For this reason, general interest attaches to the recent action of the Federal Department of Agriculture, which is this fall including in the curriculum which it has provided since 1921 for its Washington employees a course on the nature and method of research.

The course was arranged with full knowledge that it would be in the nature of an experiment, but in the belief that it was one well worth the trying. In this step there was no expectation of producing by pedagogic methods Pasteurs or Darwins in factory fashion. There was, however, a conviction that interest could be stimulated in the history, the aims and methods, and the fundamental principles of research which would be helpful in giving a more intimate conception of that type of scientific activity and its requirements.

As organized, a semester course occupying about 30 hours is being offered. It is under the immediate direction of Dr. E. W. Allen of this office, who has been long and intimately associated with agricultural experimentation as carried on by the experiment stations and the department and has had unusual opportunity to observe the development of organized research in this country. The lecture method is being largely followed, and a feature of particular interest is the opportunity afforded for discussion of specific phases of research by investigators within and without the department who can speak with much authority on matters in their respective fields.

Considerable interest has been aroused in the course within the department, and its enrollment compares very favorably with that in the various other specialized courses under way. The class is also quite representative, including both the younger generation and those of greater maturity and experience and with individuals from various branches of the department.

Among the topics considered in the course are the qualities of science, the means by which it grows, and the classes of scientific effort; the method of science, the essentials of research, and preparation for it; the formulation of scientific problems, the organization of research projects, methods and technique in different fields of inquiry, and the interpretation of data; and the function of administration in research, the formulation of the research program, correlation, and cooperation. It was introduced by a lecture on the nature and source of knowledge, followed by others dealing with the method of science, the general principles pertaining to research, the history of the development of methods, examples of the approach to scientific problems, and other general aspects of the subject.

An interesting period was devoted to the psychology of research, which in view of the fundamental relation of the individual in research is an important feature. Some of the essential attributes of the investigator were considered in other periods, the environment of research as affecting the amount and character of the product and the qualities which give results authority. The gathering and handling of research data, their interpretation, and the publication of results naturally came in for attention.

The nature and methods of research are being further illustrated by lectures in such special fields as chemistry, taxonomic biology, ecology, entomology, horticulture, nutrition, plant physiology, and other branches. Finally, the administration of research, its promotion by various means, organization within the unit, and cooperation as a means of presenting a better rounded or more effective attack will be considered.

One of the prime objects of the course has been to present certain principles relating to research which apply throughout the field of science, regardless of the particular subject, in history and bibliography as well as in chemistry and agronomy, the essential qualities of research, the motive which inspires it, the attitude of mind which controls it, and the qualifications in the individual which make for success. Emphasis has been laid on the importance of determining the real nature of a problem, its content, and organizing on this basis projects of limited range. In this connection distinction has been made between a problem, which may involve a field of considerable scope, and a project, which deals with a more definite and limited matter, representing an aspect of a problem so specific and concise as to encourage concentration and promote definite contribution within reasonable time.

This distinction is important, for after all a single investigation rarely solves a problem, and contributions to that end are about all that separate undertakings can be expected to accomplish. Viewing research as a building process, the adding of one sound brick that fits into the structure and can be relied upon in sustaining the others is usually of more advantage than the accumulation of material less specific in character which remains for others to test and fit in place.

The idea of concrete contributions to a general problem, the building of one scientific fact upon another and placing it in proper relationship, is the essence of progress in research. It implies clear thinking about the problem, the development of the plan or method on the basis of results secured as the work advances, and "sporting blood" which not only inspires persistence to go forward in spite of obstacles but gives courage to change a line of attack when it is not shedding new light.

Naturally it is realized that initiative in research can not be reduced to a set of rules; if it were, it would result mainly in routine. The qualities of the individual ultimately determine the character of the undertaking. Certain of these qualities admittedly can not be engrafted where no trace of them exists, but they may be aroused, stimulated, and guided where latent. As an eminent biologist has pointed out, about two-fifths of the greatness of a man is born in him and three-fifths made. This leaves much for training and environment.

Under present conditions, specialization often begins at an early stage, before any considerable breadth of view has been acquired in regard to scientific research in general or the writings on the subject. Such a view, either in student days or later, is obtained more or less incidentally rather than through a systematic survey which stimulates broader interest. The result is sometimes apparent in the manner of thinking about problems in agriculture and the standards workers set for themselves. Under such circumstances, a course such as has been outlined may prove very helpful.

A statement in the October issue of the *Record* regarding the establishment of the U. S. Range Livestock Experiment Station in Montana is an illustration of the error which may inadvertently creep in when reference is made to matters of priority. In this case, the attempt to call attention to an evidently important addition to the facilities for investigation in a special line led to a temporary oversight of similar work by other institutions.

The State of Texas, in particular, deserves much credit for its foresight in inaugurating on a generous scale in 1915 a station for studying problems of the range. That station has dealt with cattle, sheep, and goats, and has extended its studies to the breeding, production, and diseases of range stock, as well as problems of range management and utilization. It is serving a useful purpose, and already has demonstrated that this, no less than the more intensive types of agriculture, is susceptible of assistance in innumerable ways through carefully conducted investigation. It is another evidence of the fact that the whole range of agriculture, as represented in different parts of this country, is rapidly coming under the beneficial influence of research.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Chemistry, inorganic and organic, C. L. Bloxam, rev. by A. G. Bloxam and S. J. Lewis (*London: J. & A. Churchill, 1923, 11. ed., pp. X+832, figs. 310*).—This is the eleventh edition of the volume previously noted (E. S. R., 30, p. 707).

The glycerids of lard.—I, Analytical part. II, Synthetic part [trans. title], C. Amberger and A. Wiesehahn (*Ztschr. Untersuch. Nahr. u. Genussmtl., 46 (1923), No. 5, pp. 276–299*).—In the first part of this study of the glycerids of lard, the composition of lard is summarized as follows: The content of fatty acids is stearic acid 7.8, palmitic acid 32.2, and oleic acid 60 per cent. These acids are found almost exclusively in mixed glycerids. The unsaturated glycerids consist of oleodistearin, melting point 42° C.; oleopalmitostearin, melting point 41°; palmitodiolein, which is a colorless oil at room temperature; and a trace of triolein. The estimated composition of lard as taken from analyses of Bömer and from the present study is palmitodistearin 3, stearodipalmitin 2, oleodistearin 2, oleopalmitostearin 11, and palmitodiolein 82 per cent.

In the second part, evidence is presented leading to the conclusion that the mixed glycerids noted above consist of β-palmito-α-α-distearin, β-stearo-α-α-dipalmitin, α-oleo-α-β-distearin, α-palmito-α-β-diolein, and β-oleo-α-palmito-α-stearin.

Nature of the oil of soy bean miso, R. Kodama (*Indus. and Engin. Chem., 16 (1924), No. 5 p. 523*).—The methods of preparing two kinds of miso, a soy bean paste made by fermentation with Koji mold (*Aspergillus oryzae*), are outlined, and data are reported on the amount and composition of the oils obtained from both by ether extraction in a Soxhlet apparatus. Edo, or Tokyo, miso, prepared from equal parts of rice and soy beans, contained 4.85 per cent and Sanshu, or Haccho, miso prepared from soy beans alone 11.58 per cent of crude fat. The constants of Edo miso oil, Sanshu miso oil, and ordinary soy bean oil are, respectively, as follows: Specific gravity 0.9471, 0.9466, and 0.9237; acid number 22.49, 77.69, and 2.07; saponification number 235.35, 211, and 189.21; iodin number 117.36, 131.9, and 139.56; Hehner number 93.53, 97.96, and 95.13; and Reichert-Meissl number 3.56, 7.46, and 0.27.

The pectins of celery root, of the tubercles of Stachys tuberifera, and of the rind of the bitter orange [trans. title], J. Charpentier (*Bul. Soc. Chim. Biol., 6 (1924), No. 2, pp. 142–156*).—The author has applied to the pectins of celery root, the tubercles of Japanese artichokes, and the rind of bitter orange isolated by precipitation with acidulated alcohol the method of Bridel and Charpentier previously noted (E. S. R., 51, p. 505), and has demonstrated the presence of galactose in the hydrolysis products in each case.

The extraction of pectin from the fruit rind of the lime (Citrus medica acida), F. Hardy (*Biochem. Jour., 18 (1924), No. 2, pp. 283–290*).—A preliminary study is reported of the behavior of the pectic substances in the white rind of limes toward various extracting agents under different heat treatments, as determined by a comparison of the calcium pectate obtained from measured volumes of the extracts by the method of Carré and Haynes (E. S. R., 47, p. 610). Data are also reported on the alcohol precipitate, viscosity, total solids, ash, and pH values of the various extracts. The extracting agents used were water: N/20 HCl; 6N/5, N/2, N/20, and N/500 citric acid; and N/2, N/10, N/50, and N/75 NaOH.

Water extracted considerable pectinogen, the amount depending upon the length of time of contact and the temperature. The reaction of the water extracts was distinctly acid, values from pH 5.2 to 4.8 being obtained. Dilute hydrochloric acid at temperatures up to the boiling point extracted considerably more pectinogen than did water. Heating with dilute hydrochloric acid in the autoclave caused considerable destruction of the pectinogen.

In the experiments with citric acid, the amount extracted at 98° C. appeared to vary directly with the H-ion concentration. With an acidity less than that represented by pH 2, the amount extracted varied directly with the temperature, a larger amount being obtained in the autoclave than in open vessels at lower temperature. At higher acidity destruction of the pectinogen took place in the autoclave.

Because of the natural acidity of the water extract of pectin, treatment of the lime rind with dilute alkali yielded extracts containing more or less pectinogen provided the final reaction was not alkaline. No alkaline extracts contained pectin.

The amount of alcohol-precipitable matter contained in the extracts was larger than the amount of calcium pectate obtained, except in the extracts with low pectinogen contents. The total solid matter amounted to more than both the calcium pectate and the alcohol precipitate, the difference being particularly marked in the extracts obtained in the autoclave. The viscosity of the extracts appeared to depend more upon the conditions of extraction than upon the pectinogen content. "If viscosity be considered as a measure of the degree of incipient gelation, this observation is concordant with the experience of jelly manufacturers who have found that the jellying power of pectinogen solutions depends on the treatment to which the raw material is subjected."

A study of the influence of the new sulfur-containing amino acid (Mueller) on the activity of pancreatic amylase, M. L. Caldwell (*Jour. Biol. Chem. 59 (1924), No. 3, pp. 661–665*).—The new sulfur-containing amino acid isolated by Mueller (E. S. R., 51, p. 109) has been tested for its effect upon both the amyloclastic or starch-splitting and the saccharogenic or sugar-forming activity of pancreatic amylase by the methods previously employed in similar studies of other amino acids (E. S. R., 48, p. 608).

The new amino acid was found to resemble tryptophan and lysin in having no influence on the starch-splitting activity of the enzym under the conditions of the experiment, and to resemble all of the natural α-amino acids which have been tested in increasing the sugar-forming activity of the amylase. Attention is called to previous work in which cystin under similar conditions was found to increase the starch-splitting activity of the enzym. It was impossible to test the influence of cystin on the sugar-forming action on account of its interaction with Fehling solution.

These results are thought to furnish further evidence that the new amino acid may be a naturally occurring substance, a primary product of protein hydrolysis.

Review of analytical chemistry [trans. title], A. Kling and A. Lassieur (*Chim. et Indus.* [*Paris*], *10 (1923), Nos. 1, pp. 30–48; 2, pp. 221–244, figs. 15*).—

This consists of a brief general review of recent methods of qualitative and quantitative inorganic and organic analysis, followed by a critical review of recent literature on the use of membrane filters in analysis, the rapid determination of phosphoric acid, the analysis of denatured alcohols, the determination of H-ion concentration, and alkalimetric and acidimetric titrations.

A laboratory stirrer, C. E. Waters (*Indus. and Engin. Chem., 16 (1924), No. 5, p. 493, fig. 1*).—The stirrer described, two types of which are illustrated, is run by compressed air and is thus of particular advantage in working with volatile inflammable liquids through avoiding the use of an electric motor.

A roughage sampler, W. L. Gaines (*Indus. and Engin. Chem., 16 (1924), No. 4, pp. 386, 387, figs. 2*).—The sampler described, which has been designed for obtaining uniform samples of coarse feeding stuffs such as silage or hay, is in principle a modified cork borer on a large scale, operated electrically.

An inexpensive furnace for ashing food and excreta in porcelain crucibles, C. J. Martin (*Biochem. Jour., 18 (1924), No. 2, pp. 419–421, fig. 1*).—In the simple laboratory furnace described and illustrated, the ashing is carried on in a large porcelain crucible which is surrounded by a short length of asbestos flue pipe 5 in. in diameter, in which are inserted three pieces of iron rod, forming a triangle on which the crucible rests. The crucible is protected from below by a diaphragm of metal supporting a ring of asbestos, and above by a disc of silica with a central hole. The source of heat is an ordinary rose burner, and the necessary oxygen for combustion is supplied by air passing from a Bunsen filter pump through a silica tube inserted in the crucible from above.

The alkalinity of the ash of food materials.—II, Experimental foundations.—Simultaneous titration of a series of ash constituents [trans. title], B. Pfyl and W. Samter (*Ztschr. Untersuch. Nahr. u. Genussmtl., 46 (1923), No. 5, pp. 241–275, fig. 1*).—In this continuation of the investigation previously noted (E. S. R., 48, p. 205), certain improvements in the methods are described, and a simple volumetric procedure is outlined for the simultaneous determination of alkalinity, phosphate, manganese, iron, aluminum, zinc, lead, and boric acid.

Measuring the potential alkalinity of irrigated soils, C. S. Scofield (*Jour. Wash. Acad. Sci., 14 (1924), No. 9, pp. 192–194*).—The principle of the method described is the replacement of a combined basic constituent of the soil (sodium) by another basic element (calcium) from a leaching solution. The technique is as follows:

A 50-gm. sample of the soil to be tested, pulverized to pass a 2-mm. sieve and dried to constant weight at 105° C., is placed in a cylindrical glass tube 1 in. in diameter and 6 in. in length. Each end of the tube is closed with a thin plug of absorbent cotton and a perforated stopper, through which is inserted one arm of a small glass tube bent to a V shape. The tube containing the soil is clamped in a vertical position, and the tube leading from the top is connected with a 250-cc. receiving flask, which is stoppered with a cork having two perforations, one for the connection with the soil tube and the other for the escape of the air as it is replaced by the incoming liquid. The tube leading from the bottom of the soil tube is connected with a flask of M/80 calcium chlorid solution placed on a shelf about 3 ft. above the apparatus. The flow of this solution through the soil tube is controlled by a pinchcock placed on the rubber connecting tube. The leaching solution should be standardized for both calcium and chlorin and the percolate examined for total salts, calcium, magnesium, chlorin, sulphates, the weak acids, carbonate, and bicarbonate. If a qualitative test shows the presence of nitrates in appreciable quantities, these should also be determined.

In interpreting the results, it is suggested that the method of reacting values described by Palmer (E. S. R., 25, p. 813) be used. The potential alkalinity of the soil, which is defined as "the quantity of alkaline bases obtained in solution by leaching a sample of soil with a definite quantity of a standard solution of calcium chlorid," may be determined by the difference between the reacting values of the earthy bases, calcium and magnesium, found in the percolate and the sum of the reacting values of the acids.

Nesslerisation and avoidance of turbidity in nesslerised solutions, O. Folin (*Biochem. Jour., 18 (1924), No. 2, pp. 460, 461*).—In this reply to the paper of Stanford (E. S. R., 51, p. 10) it is suggested that the difficulties encountered by him which required the addition of the reagent drop by drop indicate that the reagent had not been prepared suitably.

The analysis of proteins, III, IV (*Biochem. Jour., 18 (1924), No. 2, pp. 312–328*).—In continuation of the series of studies previously noted (E. S. R., 51, p. 504) two papers are presented.

III. *Estimation of histidine and tyrosine by bromination*, R. H. A. Plimmer and H. Phillips (pp. 312–321).—A method is described for determining histidin in the phosphotungstic acid precipitate of the hexone bases by bromination according to the method of Plimmer and Eaves (E. S. R., 31, p. 807), tyrosin being determined simultaneously in the filtrate. In trial tests neither arginin nor lysin, both of which are also contained in the phosphotungstic precipitate, was found to absorb bromin under the conditions of the experiment, but cystin reacted with the bromate and bromin, probably by oxidation. The hydrolysis products of tryptophan, which are also capable of being absorbed by bromin, were found to be contained almost completely in the humin precipitated by lime, and these did not interfere with the reaction. Cystin is thus the only amino acid likely to cause erroneous results, and the method as described is suitable for all proteins which do not contain large amounts of cystin.

The method is described in detail, and analyses are reported of gelatin to which known amounts of histidin and tyrosin were added, singly or together. For comparison corresponding results by the Van Slyke method are included.

IV. *Some analyses of gelatin*, R. H. A. Plimmer and T. Shimamura (pp. 322–328).—The work reported in this paper consisted chiefly of a study of the accuracy of various methods of protein analysis as determined by analyses of gelatin.

Seven analyses in duplicate were first made by the Van Slyke method, the first three being carried out on gelatin alone and the other four on gelatin with the addition of histidin and tryptophan. The data for amid nitrogen were in all but one case within the limits of experimental error and the values for arginin were on the whole very constant, but the figures for histidin and nonamino nitrogen were irregular. The authors conclude that "on the whole the data by the Van Slyke method can not be looked upon as accurate, though they may give a good approximation. The irregularity may be connected with gelatin and may not be so great with other proteins, although great differences have also been found in their analyses. There is an indication that the error is in connection with the phosphotungstate precipitate. Further work is confirming this preliminary observation."

Histidin was estimated in some of the solutions of hydrolyzed gelatin by the method of Weiss and Ssobolew, and tyrosin by the Folin and Denis method. Reliable results for histidin could not be obtained, the error appearing to be in connection with the phosphotungstic precipitate. In the tyrosin determinations a loss was found to occur between the original solution and the solution after the removal of the humin nitrogen. By omitting the lime precipitation the figures for tyrosin approached the calculated quantities more closely.

A study of the acid-soluble phosphoric acid in eggs, L. Pine (*Diss., Columbia Univ., New York, 1923, pp. 26*).—The content of acid-soluble phosphoric acid in whole eggs and in the yolk of eggs of all degrees of freshness, from one day old to those that were inedible, was determined by the Chapin and Powick method (E. S. R., 33, p. 111), modified by changing the amount of hydrochloric acid to 1 cc. of concentrated acid in 200 cc. of water and decreasing the time of extraction to one hour. Since the whole egg was found to lose and the yolk to gain moisture on standing, the results were calculated on a dry basis.

The edible eggs, as judged by candling and physical examination out of the shell, varied in content of acid-soluble phosphoric acid from 72 to 95.5 mg. per 100 gm. on the dry basis for the whole eggs and from 89.7 to 122.9 mg. for the yolks. The amount was found to increase as the eggs decomposed, the increase depending upon the degree of deterioration.

A list of 13 references to the literature is appended.

Hydrogen sulfide determination in bacterial cultures and in certain canned foods, E. J. B. Willey (*Jour. Soc. Chem. Indus., 43 (1924), No. 13, pp. 9 (1924), No. 3, pp. 235–249, fig. 1*).—A rapid volumetric method of determining hydrogen sulphid is described, and data are reported on its use in determining the amount of hydrogen sulphid produced by various bacteria in peptone media and in testing canned food for the presence of hydrogen sulphid. In the process as described the hydrogen sulphid is liberated from the sample by aeration and passed through a standard iodin solution. The volatilized iodin is absorbed by passing through standard sodium thiosulphate and the hydrogen sulphid finally determined by titration. Aeration of the sample for 15 minutes was found sufficient to recover from 99 to 100 per cent of hydrogen sulphid.

It is stated that ordinary bacterial decomposition products such as volatile fatty acids, phenols, indol, skatol, alcohol, and small amounts of ammonia do not affect the liberation of hydrogen sulphid from cultures or food suspensions. Under the conditions of the experiment no hydrogen sulphid was liberated from decomposed salmon or shrimp, but canned gooseberries which had been sprayed while immature with lime sulphur spray contained large quantities of hydrogen sulphid.

An apparatus for the accurate volumetric determination of tin in canned foods, E. J. B. Willey (*Jour. Soc. Chem. Indus., 43 (1924), No. 13, pp. 70T–72T, fig. 1*).—In the apparatus which is described and illustrated the usual volumetric method by reduction to stannous chlorid, with subsequent titration with iodin, is carried out under slight pressure and in an atmosphere of CO_2. "Back-oxidation thus being rendered practically impossible, the determination may be carried out upon a much smaller sample owing to the decreased error factor, and by its use the author has obtained results agreeing very closely with those obtained gravimetrically from a larger sample."

Contribution to the investigation of milk [trans. title], R. Schmitt (*Milchw. Zentbl., 53 (1924), No. 1, pp. 1–5*).—The spontaneous souring of milk is shown not to affect the results of the determination of the specific gravity of the serum to such an extent as to render valueless this determination as a means of detecting water in milk.

A critical study of the value of the simplified molecular constant (C. M. S.) [trans. title], C. Porcher (*Ann. Falsif., 16 (1923), No. 171, pp. 16–47*).—This discussion of the significance of the simplified molecular constant of Mathieu and Ferré (E. S. R., 33, p. 208) for detecting added water in milk is based on the experience of the author and on reported work of other investigators in the use of the method. Other constants are also discussed. The conclusion is drawn that the simplified molecular constant fails in two cases, (1) when sodium chlorid is added to milk after it has been diluted and (2) when milk is diluted with its own serum, but that otherwise it is of value, particularly in separating milks which are naturally weak from milks which have been watered.

The influence of the speed of centrifuging on the Gerber method [trans. title], H. M. Høyberg (*Ztschr. Fleisch u. Milchhyg., 34 (1924), No. 13, pp. 141, 142*).—The author states that in four different tests, involving about 100 determinations each, the fat content of milk as determined by the Gerber method was at least 0.1 per cent higher in from 9 to 12 per cent of the samples centrifuged electrically than in the same samples separated in a hand centrifuge.

Methods for the volumetric determination of chlorin in milk [trans. title], F. Zaribnicky (*Milchw. Zentbl., 53 (1924), No. 2, pp. 13–17*).—Various methods for the volumetric determination of chlorin in milk are outlined briefly, and data are reported on a comparison of the method of Rusznyák and Kellner (E. S. R., 48, p. 807) with other volumetric and various gravimetric methods. Attention is called to the wide variations in the chlorin content of milk of the same animal at different milkings and from the different quarters of the udder.

Necessary conditions for testing with the reagent for vitamin C, N. Bezssonoff (*Biochem. Jour., 18 (1924), No. 2, pp. 384–386*).—In this reply to the criticism of Kay and Zilva (E. S. R., 51, p. 269) that the author's color test for vitamin C (E. S. R., 46, p. 668) is not specific, it is stated that the apparent discrepancy in results is overcome by heating the liquid in a neutral or slightly acid medium in a water bath for from 5 to 10 minutes and cooling before making the test. Under these conditions it is stated that if vitamin C is present in the original substance the color is more intense in the solution which has been heated than in a control sample not heated, while if the substance does not contain vitamin C, but gives the blue color in the cold, no color is given in the solution which has been heated. This is thought to indicate that the color reaction is given not by vitamn C itself, but by an unstable radical which is split off from it on heating. It is noted further that the color reagent must be absolutely pure to obtain satisfactory results.

The value of the Bezssonoff reaction as an indicator of the presence of vitamin C in the juice of sauerkraut [trans. title], P. E. Wedgewood and F. L. Ford (*Bul. Soc. Chim. Biol., 6 1924), No. 3, pp. 217–219*).—The authors report that the juice of sauerkraut, which gave an intense blue color with the Bezssonoff reagent, did not protect guinea pigs from scurvy in doses of from 0.5 to 2 cc. daily. It is concluded that this reagent is not an infallible indicator for the presence of vitamin C.

A complementary condition for the test of the reagent for vitamin C [trans. title], N. Bezssonoff (*Bul. Soc. Chim. Biol., 6 (1924), No. 3, pp. 220–225*).—In this reply to the above paper the author emphasizes the conditions under which the test should be carried out, as given in the reply to Kay and Zilva noted above, and reports the results of a series of tests conducted with this reagent on freshly made sauerkraut and on the sample after standing for a considerable time. A positive test was obtained at first, which gradually became weaker and finally negative. This is thought to indicate that freshly made sauerkraut contains some vitamin C, which is gradually destroyed on standing.

The determination of pentosans in wood cellulose, W. J. Powell and H. Whittaker (*Jour. Soc. Chem. Indus., 43 (1924), No. 8, pp. 35T, 36T*).—The method described is based upon the quantitative reaction between furfural and bromin in dilute acid solution in the proportion of 1 molecule of furfural with 4 atoms of bromin. The technique of the procedure is as follows:

An amount of material weighing between 0.5 and 0.8 gm. is distilled with 12 per cent hydrochloric acid until the distillate gives no color with anilin acetate. The distillate is made up to 500 cc. with 12 per cent hydrochloric acid, and 200 cc. is added to each of two bottles containing 25 cc. of standard, approximately N/10, sodium bromid-bromate solution, while to two other bottles containing the same amount of the standard bromid-bromate solution 200 cc. of 12 per cent hydrochloric acid is added. The bottles are left in the dark for one hour, and, after the addition of 10 cc. of 10 per cent potassium iodid solution, the liberated iodin is determined by titration with N/10 sodium thiosulphate.

The chemical analysis of cotton, II–VI (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 2 (1924), No. 32, pp. 383–394, figs. 2; 3 (1924), Nos. 1, pp. 1–6, figs. 2; 2, pp. 7–19, figs. 2; 3, pp. 20–29, figs. 2; 4, pp. 31–48, figs. 2*).—In continuation of the investigation previously noted (E. S. R., 50, p. 413), five papers are presented.

II. *The determination of copper number*, D. A. Clibbens and A. Geake.—Various methods at the present time in use for determining the copper number of cotton cellulose, which is defined as the weight of copper reduced by 100 gm. of the sample from the cupric to the cuprous state under standardized conditions, are discussed, and a critical examination is reported of a method described by H. Braidy[1], in which Fehling's solution is replaced by a solution of copper sulphate made alkaline by the addition of a mixture of sodium carbonate and bicarbonate. The material to be examined is heated in this solution for three hours in a boiling water bath, and the extent of reduction is determined by the use of iron alum and standard permanganate solution. The method is said to give low and constant copper numbers for pure cotton cellulose, to be very sensitive to slight modifications of the cotton by acids or oxidizing agents, and to yield results which can be duplicated accurately.

III. *Micro-analytical methods for the examination of small quantities of waxes, in particular cotton wax*, R. G. Fargher and L. Higginbotham.—Micromethods are described for the determination of the saponification number, acid value, unsaponifiable matter, acetyl number, and iodin number of fats and waxes. Since only from 0.1 to 0.2 gm. of the material is required for the method, the determinations can be made on from 100 to 300 gm. of raw cotton, sized yarn, or fabric, and from 400 to 500 gm. of bleached cloth.

IV. *The phosphorus content of cotton*, A. Geake.—A rapid sedimetric method for the determination of phosphorus in ashed samples of raw cotton is described, and the results are reported of the application of the method to cottons of different origin and prepared in various ways.

The method consists in precipitating the phosphorus from a solution of the ashed cotton with strychnin phosphomolybdate, and comparing the volume of the precipitate with that of a known volume of standard phosphate solution under the same conditions. The method is said to give results accurate to 5 per cent with 0.06 mg. of phosphorus pentoxid, corresponding to about 0.12 gm. of American or 0.06 gm. of Egyption cotton. The average values obtained for a number of trade cottons are as follows: American 0.05 per cent P_2O_5, Sea

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[1] Rev. Gén. Mat. Color., 25 (1921), No. 291, pp. 35–42.

Island 0.07, Sakellaridis 0.12, Egyptian other than Sakellaridis 0.09, and South American 0.07 per cent P_2O_5.

On account of the lack of uniformity of the material in raw cotton direct from the bale, this method is not suitable for the determinaion of phosphorus in bale cotton, but is suitable through any stage of the manufacturing operations subsequent to carding.

V. *The determination of nitrogen in cotton*, B. P. Ridge.—Nitrogen determinations are reported on a large number of samples of raw and bleached cotton. The Kjeldahl method, with mercury as catalyst, was used for the digestion in both cases. With raw cotton the nitrogen was finally determined by titration in a microtitration apparatus and with bleached cotton colorimetrically by the Folin method.

The results obtained showed a variation in the nitrogen content of the different varieties of raw cotton, but the differences were not so marked as those observed in the phosphorus content. The nitrogen content of bleached cotton was low, and did not vary greatly with the variety of cotton or the nature of the bleaching process. It is concluded that the determination of nitrogen is of minor importance as a method for the control of cotton bleaching.

VI. *The determination of fat, wax, and resin*, P. H. Clifford, L. Higginbotham, and R. G. Fargher.—"The use of organic solvents for the extraction and estimation of fat, wax, and resin in raw cotton and sized and bleached goods is discussed. The extractable matter is a complex mixture, and, judging by the analytical characteristics of extracts obtained in various ways, no complete separation of the constituents is possible by solvent extraction. Hot chloroform appears to be the most inclusive solvent, whereas ether, benzene, and carbon tetrachlorid do not easily remove the resinous matter. It is recommended, therefore, that extraction with chloroform in a hot Soxhlet apparatus be taken as a measure of the fat, wax, and resin present, and extraction with carbon tetrachlorid in an ordinary Soxhlet apparatus as determining the fat and wax only."

The action of light on dyes applied to cotton fabrics.—A summary of the literature, P. W. Cunliffe (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 3 (1924), No. 8 pp. 83–104*).—This is an extensive review of the literature on the fading of dyed cotton fabrics. A bibliography of 85 titles is appended.

Varnishes and their components, R. S. Morrell (*London: Henry Frowde and Hodder & Stoughton, 1923, pp. XII+361, figs. 43*).—In this summary of recent advances in the study of varnishes and their components, considerable attention is paid to the chemical composition of the components of varnishes and the changes which they undergo in the combinations in which they are used. Part 1 deals with the components of varnishes, including drying and semidrying oils, varnish resins, bituminous substances, and varnish solvents. Part 2 includes the various types of oil varnishes, spirit varnishes, and insulating varnishes, with chapters on properties and defects of varnishes and drying oil and oil varnish analysis. Many references to the literature are given at the end of each chapter.

Studies on "moskonfyt" [trans. title], A. I. Perold (*Ann. Univ. Stellenbosch, 1 (1923), A, No. 1, pp. 18*).—In South Africa the term moskonfyt is used for a grape sirup prepared from grape juice by boiling in an open kettle over a direct fire. The resulting sirup, which is said to be of a dark brown color and pleasant taste, is used as a table sirup and in the sweetening of certain wines. The studies reported deal with the best methods of preparing and deacidifying the must, concentrating the sirup, and preventing crystallization.

The best method of preserving the must is thought to be the use of sulfur dioxid in the proportion of 200 mg. per liter. For deacidification from 3.5 to 4 lbs. of calcium carbonate is added to every 100 gal. of must with an original total acidity of from 5 to 6 per cent. The sirup is boiled to 71° Brix.

METEOROLOGY.

The periodicity of meteorological factors in relation to agriculture, F. Eredia (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 1 (1923), No. 3, pp. 545–560*).—The various studies which have been made on this subject are critically reviewed, with special reference to the basis they furnish for long-term forecasts.

The author states that he is "skeptical as to the possibility of applying our knowledge of solar periods to any practical purposes." He does not believe it possible to demonstrate "any periodicity of the meteorological characters of the different seasons." It appears possible, however, on the basis of the facts demonstrated by many correlation studies "to forecast seasonal variations in rainfall, as well as in temperature. The system employed is radically different from the old method based essentially on statistical data, and rests upon a knowledge of the contemporaneous distribution of meteorological factors over a large surface of the globe, for it has been ascertained that a compensation exists between the climatic variations of one region and those of somewhat distant parts of the world." Thus an increase in the rainfall and rise in the temperature of one region is found to be contemporaneous with lower rainfall and temperature in another.

A bibliography of 56 references to literature on the subject is given.

A study of long range forecasting for California, based on an analysis of past rainy seasons, L. E. Blochman (*Bul. Amer. Met. Soc., 5 (1924), No. 6–7, pp. 100, 101*).—The following statements are quoted from the author's abstract of a paper on this subject presented at the June meeting of the American Meteorological Society:

"A study of seasonal forecasting is outlined on the theory that conditions form over the Pacific Ocean before the rainy season begins, and also during the opening months, that give high average seasonal probabilities. . . .

"The author asserts that when low pressure areas enter directly off the central to southern California coast in September or October there is a 90 per cent probability that the ensuing season will be an average to wet one. The lower down the coast the lows enter, the heavier will the precipitation be for southern California for the ensuing season."

Phenology and agriculture, R. Scharfetter (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 1 (1923), No. 3, pp. 561–572, fig. 1*).—This is primarily an exposition of the author's studies and conclusions regarding rhythm in climatic phenomena, vegetation, and plant formation.[1] He states that by climatic rhythm (klimarhytmik) "is meant the annual course of meteorological phenomena." Vegetation rhythm (vegetationsrhytmik) "embodies phenomena in the development of individual plants in the course of the year (foliage, blossoming, ripening)," and plant formation rhythm (formationsrhytmik) "signifies collective phenomena occurring in the development of a whole group of plant life."

The discussion appears to be based primarily on heat and moisture conditions, no account apparently being taken of the light factor. Examples of the application of the author's conclusions to actual conditions in Europe are cited to show the great variety of problems phenology is capable of presenting if regarded "in its true light, namely, as the study of periodical development in plants in conjunction with annual climatic phenomena. The science of phenology promises many important discoveries in connection with possibilities in foreign plant cultivation, and holds the key to the origin of innumerable varieties of plant life which abound in our fields and meadows."

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[1] Klimarhytmik, Vegetationsrhytmik und Formationsrhytmik. Österr. Bot. Ztschr., 71 (1922), No. 7–9, pp. 153–171, fig. 1.

[Reports on phenological observations in the British Isles], J. E. Clark, H. B. Adames, and I. D. Margary (*Quart. Jour. Roy. Met. Soc. [London], 47 (1921), No. 200, pp. 217–250, figs. 3; 48 (1922), No. 204, pp. 293–327 figs. 3; 49 (1923), No. 208, pp. 239–272, figs. 4*).—These reports give the results of observations during the three years ended November 30, 1920, 1921, and 1922, at over 200 different places in the British Isles. Attention is especially called to the fact that the last report named, in addition to isophenes for 1922, gives for the first time floral isophenes for the 30-year averages, 1891–1920. "These average isophenes show well-defined areas of early and late dates, closely related to elevation."

The correlation of meteorological and crop data (*Scot. Jour. Agr., 7 (1924), No. 3, pp. 329, 330*).—A plan for more precise observation and study of the relation of crops to weather, inaugurated by the Meteorological Committee of the Agricultural Research Council of Great Britain, is described substantially as previously noted (E. S. R., 51, p. 499).

Grassland as a source of rainfall, F. E. Clements (*Bul. Amer. Met. Soc., 5 (1924), No. 6–7, p. 101*).—An abstract is given of a paper on this subject presented at the June meeting of the American Meteorological Society, as follows:

"The fact that a plant may transpire more water than a water body of equal surface evaporates led to experiments to measure the transpiration of representative prairie communities. This was done by incasing sods in 3-ft. cylinders without disturbing the roots and weighing these at the desired intervals in the true prairie, mixed prairie, and short grass plains, with annual mean rainfall, respectively, of 28, 23, and 17 in.

"It was found that the transpiration in each community was more than sufficient to provide its precipitation during a year. The cereal crops were found to transpire at about the same rate as the native grasses, while alfalfa lost somewhat more water. The water loss from the native wheat grass nearly equaled that from millet; . . . the loss from grama and from oats was the same, with bluestem transpiring nearly twice as much. The loss from alfalfa . . . was about a third greater than that from bluestem. The results explain why ordinary settlement and cultivation have not increased rainfall, but suggest that afforestation over wide stretches would do so."

Some features of the climate of Alaska, M. B. Summers (*Bul. Amer. Met. Soc., 5 (1924), No. 6–7, pp. 102, 103*).—An abstract of a paper on this subject presented at the June meeting of the American Meteorological Society is given as follows:

"Features of the climate of Alaska are the great extremes of temperature and precipitation. Tropical temperatures in summer and extreme cold in winter are recorded in the interior valleys, while the precipitation of the southeastern portion exceeds in both quantity and frequency that which has been recorded in any part of continental United States. Studies in the variability of the mean temperature and total precipitation for periods of 12 consecutive months, disregarding the calendar year, show the maximum and minimum departures from the normal for such selected periods to be similar to those at Bismarck, N. Dak., for the interior valleys of the territory, and to those at Seattle, for the southeastern portion.

"The economic development that has already taken place in Alaska has been achieved largely through the aid of the prevailing climatic conditions, rather than in spite of them, as is sometimes contended."

Bibliography of meteorological literature (*Roy. Met. Soc. [London]. Bibliog. Met. Lit., Nos. 3 (1922), pp. 55–74; 4 (1922), pp. 75–94; 5 (1923), pp. 95–119*).—These three half-yearly issues bring this bibliography up to June, 1923. Previous numbers have been noted (E. S. R., 48, p. 614).

SOILS—FERTILIZERS.

Soils and fertilisers, H. J. PAGE (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 8 (1923), pp. 407–431*).—In a contribution from the Rothamsted Experimental Station a review is presented of those aspects of the subject which represent the most noteworthy advances during the past year from both the practical and technical standpoints.

[Soil studies at the Missouri Station] (*Missouri Sta. Bul. 210 (1924), pp. 65–70, figs. 5*).—Soil management, crop rotation, and fertilizer experiments on the more important soil types of Missouri are briefly reported by M. F. Miller and F. L. Duley. Studies to determine the relative loss of soil from land under different systems of management (E. S. R., 51, p. 210) demonstrated the effectiveness of a crop on the land in cutting down both erosion and run-off. Both sod and wheat reduced erosion, and a corn crop reduced the erosion to about 50 per cent of that on land plowed in a similar way and having no crop. Crop rotation effected a great saving of surface soil. The effectiveness of commonly accepted soil improvement processes in increasing the nitrogen content of soil was demonstrated.

Studies by W. A. Albrecht to determine how long legume bacteria will live in the soil in the absence of the crop which nourishes them showed that after five years the legume bacteria were still living, although the number of nodules produced per plant decreased. It is concluded that when a soil is once well inoculated for either soy beans or red clover it will not need to be reinoculated when these crops come around again in a 4- or 5-year rotation.

Studies by Albrecht on nitrate production in a soil as affected by crop and cultivation confirmed results previously noted (E. S. R., 48, p. 616). Limestone was outstanding as a means of increasing nitrification for all crops and all fertilizer treatments. Cultivated soils showed considerably lower rates of nitrate accumulation than soils more often left in sod crops.

In studies by Miller and Duley on the effect of weathering and storage upon the composition of barnyard manure, manure in a flat pile 6 in. deep on the ground lost 39.5 per cent of its nitrogen during 5 months' exposure from April to September. The loss from a conical pile on the ground was 26.55 per cent during the same period.

The formation of a new island in the Mississippi River, C. A. SHULL (*Ecology, 3 (1922), No. 3, pp. 202–206, figs. 2*).—This contribution from the University of Kentucky gives a descriptive and historical account of the formation and the vegetation of an island, six years old, that is forming in Chute No. 5 of the Mississippi River between Island No. 5 (Wolf Island) and the Missouri bank. This new island is of interest, partly, because it gives a concrete idea of the rapidity of deposition under favorable conditions.

Soil survey of Iowa—Reports 33, 34, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpts. 33 (1924), pp. 63, pl. 1, figs. 14; 34, pp. 70, pl.*

1, figs. 14).—Two county soil surveys are presented which included analyses and greenhouse and field experiments to determine the composition, fertilizer requirements, and crop adaptations of the prevailing soil types, together with a dscription of the method of conducting soil surveys in Iowa.

No. 33, Mills County soils.—This is an area of 275,200 acres lying within the Missouri loess soil area in southwestern Iowa. The natural drainage system of the county is said to be good. The topography is as a whole gently to smoothly rolling. The soils are grouped as loess, terrace, and swamp and bottomland, the loess covering 60.8 and the swamp and bottomland 35 per cent of the area. Including riverwash and meadow, 18 soil types of 9 series are mapped, of which the Marshall silt loam loess soil and the Wabash silt loam swamp and bottomland soil cover 58.4 and 21.8 per cent of the area, respectively. The soils of the county are said to be not all acid in reaction, and in many areas there is a considerable lime content, particularly in the subsoil. The organic matter content of the soils is not high except in the case of some of the bottomland types. The phosphorus content is said to be low in most of the soils.

No. 34, Boone County soils.—This is an area of 364,160 acres lying entirely in the Wisconsin drift soil area in central Iowa. The topography of the greater part of the county is level to gently rolling, and the drainage in general is rather poor except in the areas adjacent to the Des Moines River, Squaw Creek, and Beaver Creek. The soils are grouped into drift, terrace, and swamp and bottomland soils, the drift soils covering 93.3 per cent of the area. Including peat and muck, 17 soil types of 9 series are mapped, of which the Carrington, Clarion, and Webster loams and the Webster silty clay loam drift soils cover 40.4, 20.1, 16.3, and 11.1 per cent of the area, respectively. The soils of the county are said to be generally acid. The contents of organic matter and nitrogen are deemed adequate in most cases, but the phosphorus content is low.

Soil Survey of Somerset County, Maryland, J. M. Snyder and J. H. Barton (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+1287–1316, fig. 1, map 1*).—This survey, made in cooperation with the Maryland Geological Survey and the Maryland Experiment Station, deals with the soils of an area of 216,960 acres lying within the Coastal Plain province on the Eastern Shore of Maryland. The topography is in general flat to slightly undulating. There is said to be a sufficient number of drainage ways to give adequate drainage to the county, but because of the slight fall and the effect of the tides the water is not carried off as rapidly as it should be. The deficiency is most apparent in the western half of the county. The only extensive area where the secondary streams afford good drainage is in the northeastern part of the county.

The soils of the county are said to be prevailingly light in color and, with the exception of the dark-colored soils, most of them are neutral or only slightly acid. Including tidal marsh, swamp, and meadow, 16 soil types of 4 series are mapped, of which tidal marsh and the Elkton silt loam, loam, and fine sandy loam cover 29.4, 18, 13.6, and 12.3 per cent of the area, respectively..

Soil survey of Pawnee County, Nebraska, H. L. Bedell et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. III+1317–1350, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska Soil Survey, deals with the soils of an area of 275,840 acres lying in the glaciated part of the Great Plains province in southeastern Nebraska. The county is said to be essentially a plain sloping gradually toward the southeast, and includes areas of almost flat to rolling upland, large areas of eroded, rolling to hilly slope land, and narrow strips of flat alluvial land. Drainage is said to be as a whole thorough though not excessive.

The soils are grouped as those derived from loess or the silty upland material, those derived from glacial drift, residual or partly residual, and alluvial soils. Including rough stony land, 12 soil types of 7 series are mapped, of which the Carrington silt loam and loam and the Wabash and Pawnee silt loams cover 33.7, 28.3, 12.9, and 11.1 per cent of the area, respectively.

Moravian red soils [trans. title], E. Blanck, F. Kunz, and F. Preiss (*Landw. Vers. Sta., 101 (1923), No. 5-6, pp. 246-260, figs. 2*).—Studies of samples of red soil from two localities in northern Moravia and of the stony form of one of them are reported.

Mechanical analyses of these soils showed that the fine sand fraction from 0.06 to 0.02 mm. in size and the raw clay fraction prevailed. Chemically, these soils were of typical red soil formation.

In general the contents of calcium oxid and ferric oxid were the most variable. Also these two constituents were generally present in inverse ratio. The determination of the silica soluble in alkali in the two soils and in the stony part of one showed respective ratios of alumina to silica of 1:2.14, 1:1.82, and 1:6.7. This indicates an approximate correspondence between the soils but not between the soils and the stony fraction.

Representative Transvaal soils.—VII, The Highveld black turf, B. J. Smit (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 5, pp. 527-531*).—In a further contribution on the subject (E. S. R., 51, p. 118), data on the mechanical and chemical composition and fertility requirements of a gray-black to blue-black heavy clay soil are presented and discussed. This soil is considered to be a sedentary soil covering basic igneous rocks. The outstanding feature of the mechanical analyses is the high percentage of clay contained in this soil. It is remarkably free from stones, is very adhesive when wet, and retains a great deal of moisture. If left undisturbed it cracks badly on drying and finally crumbles, but if worked when wet it forms hard lumps on drying which break down with difficulty. The chemical analyses indicate that this soil is rich in nitrogen and is generally well supplied with total and available potash. It is considered to be deficient in available phosphoric oxid.

Chemical composition of some concretions of tropical soils [trans. title], E. Blanck and W. Geilmann (*Landw. Vers. Sta., 101 (1923), No. 5-6, pp. 217-245*).—Studies of the chemical composition of some concretions from Cuban soils are reported.

The results showed that iron concretions with a high content of ferric oxid, exceeding 50 per cent of the total mass and having a molecular ratio of aluminum oxid to silicon dioxid of 1:2 or less, are apparently typical for red soils or formerly red soil formations.

The concretions of laterite were found to be prevailingly iron or hydrargillite concretions. In other red soils iron and also lime concretions seemed to prevail. The lime concretions are apparently not limited to the red soils. Similar iron concretions were found in tropical gray and brown soils not of red soil origin. The chemical composition and other properties of these concretions are essentially different, however.

The importance of hydrogen-ion concentration control in Physicochemical studies of heavy soils, R. Bradfield (*Soil Sci., 17 (1924), No. 5, pp. 411-422, figs. 6*).—Studies conducted at the Missouri Experiment Station on the H-ion concentration existing in heavy soil after the soil and treatments thereof have reached equilibrium are reported.

The results indicate that the H-ion concentration exerts a profound influence in all physico-chemical studies of soils. The laboratory studies on the colloidal fraction of acid clays showed (1) that standard hydroxid solutions when titrated with the acid clay solutions give titration curves characteristic of weak polybasic acids by either the conductivity or the hydrogen electrode method, (2) that equivalent amounts of different bases are required for neutralization, and (3) that the H-ion concentration of concentrated solutions of colloidal clay varies in the same way on dilution as with ordinary weak acids.

These studies are considered to offer further evidence of the chemical nature of the reactions of colloidal clay when coupled with the work (1) on the relation of the H-ion concentration to the flocculation of an acid clay and a neutral clay, (2) on the effect of the concentration of the colloidal clay upon the variation in the amount of electrolyte required for flocculation at different Sörensen values, and (3) on the effect of the H-ion concentration upon the absorption and exchange of bases.

Soil acidity and its relation to the production of nitrate and ammonia in woodland soils, G. R. CLARKE (*Oxford Forestry Mem. 2 (1924), pp. 27, pl. 1, figs. 3*).—Studies on the different factors affecting acidity and the production of ammonia and nitrate in a series of woodland soils are reported.

It was found that the nitrate content of the soils did not vary greatly from hour to hour when samples were taken through the day. A definite relationship was found to exist between the lime requirement of a soil and its content of organic matter. The pH value of a soil growing a forest crop indicated the least acid when the crop was in full growth.

The accumulation of ammonia was found to be greater in very acid soils than in slightly acid and neutral soils. The ammonia of a very acid soil was liable to rapid fluctuation. The soil showed a greater retentive power for ammonia when in certain conditions of moisture content.

Nitrate was found to be present in measurable quantities in very acid soils, and was apparently independent of seasonal changes. The greatest difference between the less acid soils and the acid soils is thought to be best expressed by their nitrate contents. While the nitrates of the less acid soils, although fluctuating all the time, tend to reach a general minimum on August 22, there is no evidence of a similar condition existing in acid soils. The conditions in all of the acid soils were such that they determined their minima at different dates, and in general the nitrate content fluctuated independently of the factors governing its production in the less acid soils.

A similar distinction was maintained in the case of ammonia.

Soil temperature determinations [trans. title], J. HUDIG (*Landbouwk. Tijdschr.* [*Utrecht*], *1924, May, pp. 196–201*).—In a contribution from the Groningen Experiment Station, Netherlands, tabular data from temperature determinations are reported which were made on sandy, gravelly, and clay soils to show the influence of the severe winter from October, 1923, to March, 1924, inclusive.

Soil temperatures during the sharâqi period and their agricultural significance, E. M. TAYLOR and A. C. BURNS (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 31 (1924), pp. [2]+46, pls. 8*).—Studies of soil temperatures at various depths during the sharâqi period of 1922 showed that partial sterilisation of the soil can be effected to a depth of 5 cm. (about 2 in.) with the present type of sharâqi. The maximum soil temperatures were found to be dependent upon the minimum temperature during the previous night and the daily range of temperature as shown by screen thermometers. A temporary suppression of the detrimental factor could be secured between depths of 5 and 18 cm. with the present type of sharâqi.

The application of such temperature records to agricultural practice is discussed, and it is suggested that the tillage of sharâqi land will intensify the sharâqi effect and thus compensate for the reduction in sharâqi area. The value of the period from July 25 to August 21 as regards partial sterilization is shown. The postponement of the sowing date of maize is suggested as a means of lengthening the sharâqi period. Means by which the maximum effect of the sharâqi period can be obtained are also discussed.

Preliminary note on the soil temperature in sharâqi land, E. M. Taylor and A. C. Burns (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 34* (*1924*), *pp.* [*2*]+*12*, *pls. 20*).—Studies are reported which demonstrated the effects of certain meteorological factors in determining soil temperature, and showed the possibility of using soil isotherms to determine the value of a period with reference to partial sterilization. Soil isotherms may also be used to determine the magnitude of the effect of meteorological factors upon soil temperature. Studies also showed the temperature conditions in a soil during a series of periods.

Soil temperature and its influence on white grub activities, J. W. McColloch and W. P. Hayes (*Ecology, 4* (*1923*), *No. 1*, *pp. 29–36*, *figs. 2*).—Studies conducted at the Kansas Experiment Station are reported which showed that there is a complete overturn of the temperature of the soil twice during the year, the first occurring in March and the second in October. Coincident with the spring overturn, the white grubs and May beetles come up above the plow line, and with the fall overturn they return to the subsoil. The annual range of the soil temperature, as well as the daily range, was found to decrease materially with depth, and the annual range at 1-ft. depth is only one-half of that of the air. The soil was found to respond slowly to outside temperature changes, the response at 1-ft. depth usually occurring the same day, while at lower depths it is approximately one day later for each foot of soil.

Analysis of soil by the bacteria [trans. title], D. Chouchack (*Compt. Rend. Acad. Sci.* [*Paris*], *178* (*1924*), *No. 22*, *pp. 1842–1844*).—A method of determining what nutritive constituents in a soil are relatively in minimum by use of the catalytic action of the soil bacteria on water saturated with oxygen is briefly outlined.

It is pointed out that the decomposition of oxygenated water by soil is due to the catalytic action of the soil organisms on the one hand and of the mineral and organic constituents of the soil on the other. The catalytic action of the bacteria is destroyed by heating to the boiling point so that a so-called biologic index of a soil is easily established.

Treatment of a soil with nitrogen, phosphoric acid, and potash singly and in combinations and determination of the catalytic decomposition of oxygenated water by the treated and untreated soil is thus advanced as a method of determining directly what nutritive constituents are relatively in minimum. The results of this process are said to have been checked by cropping experiments.

The soil organic matter and growth-promoting accessory substances, N. A. Clark (*Indus. and Engin. Chem., 16* (*1924*), *No. 3*, *pp. 249, 250*).—In a contribution from Iowa State College, a brief review and discussion of growth-promoting accessory substances and so-called auximones in soils are presented.

The nitrogen content of Kirkland silt loam as influenced by different cropping and soil treatment, H. F. Murphy (*Jour. Amer. Soc. Agron., 16* (*1924*), *No. 6*, *pp. 363–366*).—Studies conducted at the Oklahoma Experiment Station are briefly reported showing that cereals reduced the nitrogen content of the surface and subsurface soils. This reduction was not so great where cereals and cotton were grown. Where alfalfa was grown there was a gain in the nitrogen content of the surface and subsurface soils.

Where lime was applied either on soil not otherwise treated or where treated with manure, the nitrogen content of the surface soil was somewhat lower than that of unlimed soils. At the same time the subsurface soils showed a higher nitrogen content than the check or manured and unlimed soils. With any soil treatment where alfalfa was grown, the nitrogen content of the subsurface soil was greater at the end of eight years than at the beginning.

An inquiry into the reason for the large accumulation of nitrates in soil following the growth of clover or alfalfa, T. L. Lyon, J. A. Bizzell, and B. D. Wilson (*Jour Amer. Soc. Agron., 16 (1924), No. 6, pp. 396–405, fig. 1*).—Studies conducted at Cornell University are reported which indicated that the large and rapid accumulation of nitrates in soil previously planted to clover or alfalfa as compared with soil previously planted to timothy is apparently connected with the higher nitrogen content of the legumes. It is not necessarily associated with a larger total quantity of nitrogen in the legume soil, but rather with its smaller quantity of nonnitrogenous organic matter. This source of energy for nitrate-decomposing organisms is present in smaller quantity in the residues of the legumes than in that from timothy. There is consequently less destruction of nitrates in soil previously planted to clover or alfalfa than in soil previously in timothy.

It is also considered probable that this may be a factor in determining the effect which other crop residues exert on nitrate accumulation and thus on the supply of available nitrogen for succeeding crops.

Carbon dioxid content of the air over unfertilized soil and soil fertilized with stall manure [trans. title], O. Lemmermann and H. Kaim (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 1, pp. 1–8*).—Studies are reported which yielded no evidence that the carbon dioxid content of the air over soils lightly fertilized with stable manure is greater than the average carbon dioxid content of the atmosphere.

Investigations on the lime-phosphoric acid factor with reference to the Aereboe-Wrangell fertilization system [trans. title], E. Günther (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 1, pp. 17–26*).—Field studies with loamy sand soil are reported which showed that while the size of the lime-phosphoric acid factor indicated a sharp differentiation between plants requiring available phosphoric acid for their best growth and plants able to obtain sufficient phosphoric acid from relatively insoluble phosphates, the assimilation of phosphoric acid by the same plant under different fertilization conditions did not follow any fixed law, such as advanced by Wrangell.

Apparently there was no great variation in the assimilation of phosphoric acid by the same plant under different conditions. This was not true with lime, however. Plants containing much lime assimilated more lime in relation to phosphoric acid when receiving physiologically acid fertilization than when receiving physiologically alkaline lime fertilization. This is explained on the basis that the gypsum resulting from the acid fertilization is easily available to plants. Thus the assimilation of lime alone may determine the size of the lime-phosphoric acid factor.

Since normal soils usually contain sufficient easily available lime for crops, there is thought to be no reason why crops should attack difficulty soluble lime phosphates in order to satisfy their need for lime.

[Soil fertility studies at the Moses Fell Annex by the Indiana Station], H. J. Reed and E. W. Moore (*Indiana Sta. Circ. 117 (1924), pp. 3–9, figs. 3*).—

The results of general experiments on the fertility of these soils are briefly summarized. It is stated that the greatest single need of this type of soil is phosphorus.

[Soil fertility studies at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1923, pp. 2–6*).—The progress results of experiments on supplying organic matter to the soil and the efficiency of fertilizers and other manures are briefly summarized (E. S. R., 49, p. 510).

The results of fertilizer experiments, 1922–1923, M. Nelson and W. H. Sachs (*Arkansas Sta. Bul. 192 (1924), pp. 3–12, figs. 2*).—The results of fertilizer experiments conducted on the different farms of the station during 1922 and 1923 are briefly summarized, continuing earlier work (E. S. R., 47, p. 519).

In the Coastal Plain section the largest increase in yield of seed cotton during 1922 was produced where manure was reinforced with acid phosphate, and the second largest increase where manure was used alone, followed in order by a heavy application of a complete fertilizer, the lighter application of a complete fertilizer, and a mixture containing nitrogen and phosphorus. The increased yield obtained where nitrogen and phosphorus were used together was more than the combined increase of the plats where these elements were used separately. In the hill section the largest increases in yield of cotton and corn were obtained with manure reinforced with acid phosphate, and the second largest from a heavy application of a complete fertilizer. In the lowland section the heavy application of a complete fertilizer resulted in the largest increases, followed by manure reinforced with acid phosphate.

In the Coastal Plain section the largest increase in the yield of seed cotton during 1923 was produced with the heavy application of a complete fertilizer, followed by that with manure. In the hill section the heavy application of a complete fertilizer showed the largest increase in the yield of seed cotton, and manure reinforced with acid phosphate the largest increase in the yield of corn. In the lowland section the largest increase in the yield of seed cotton was also produced with the heavy application of a complete fertilizer.

Application of the law of diminishing returns to some fertilizer data, W. J. Spillman (*Amer. Fert., 60 (1924), No. 13, pp. 42, 44–46, 51–54, figs. 3*).—In a contribution from the U. S. Department of Agriculture, a brief mathematical discussion is presented showing the application of the law of diminishing increments to fertilizers, the purpose being to determine the optimum quantity of a given fertilizer to use in a given case.

The relation of livestock to the maintenance of fertility, G. Roberts (*Ky. Agr. Col. Ext. Circ. 164 (1924), pp. 20*).—Practical information on the relation of livestock raising to the maintenance of the fertility of Kentucky soils is presented. The conclusion is drawn that the rolling land of Kentucky can be most profitably utilized by keeping it in grass to be pastured with livestock, while the more level lands may be used to produce feed for the stock during the winter. Treatment of the soils outside of the blue grass region with phosphate, leguminous green manuring, and the conservation and use of all stable manure are recommended practices.

Variations of the contents of plant nutrients in stable manure after the war [trans. title], O. Schiller (*Landw. Vers. Sta., 101 (1923), No. 5–6, pp. 293–332*).—Chemical studies of samples of stable manures representative of large and important areas of Germany are reported showing that there has been a general decrease in the contents of nitrogen and phosphoric acid but an increase in potash since the war. This is taken to indicate the necessity of a more general use of artificial fertilizers supplying the deficient constituents.

Nitrogen survey.—Part III, The air-nitrogen processes, J. M. Braham (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 240 (1924), pp. II+41, pl. 1*).—Continuing the series previously noted (E. S. R., 51, p. 518), this publication deals with the status of the different air nitrogen processes, including the arc, cyanamid, and direct synthetic ammonia processes, and miscellaneous other processes. It is stated that the first three processes are the only ones which have as yet been applied on a large commercial scale. A fourth, the cyanid process, is now represented by one small commercial plant, and it is thought that this process will probably eventually supply most of the cyanid demand of the world. The direct synthetic ammonia process appears now to be the most promising. Data are also presented on the interrelation of nitrogen-fixing processes and products and on the growth of the nitrogen fixation industry.

The fixation of nitrogen as cyanide, R. Franchot (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 235–238*).—This is an analytical discussion indicating that when working at a capacity of 40,000,000 tons of pig iron the American blast furnace is fixing nitrogen probably at the rate of 6,000,000 tons a year and is spending coke in doing it. This is double the rate at which it has been estimated that nitrogen is taken from the soil in crops. Thus, in terms of energy the hearth of the blast furnace in the United States develops some 12,000,000 kw., of which 25 per cent is apparently available for and absorbed in work done at 1,500° C. Of this it appears that one-half is devoted to keeping in circulation a large accumulation of alkali as cyanid. Thus, there appears to be power here of the order of 2,000,000 h. p., not only developed and available but actually already engaged in nitrogen fixation.

Value of the organic nitrogen in koufri, marog, and tafla [trans. title], V. M. Mosséri (*Bul. Union Agr. Égypte, 22 (1924), No. 152, pp. 1–8*).—Studies are briefly reported showing that the organic nitrogen content of koufri (E. S. R., 48, p. 819) is almost entirely unavailable to plants, although a part of this nitrogen may be transformed into nitrate in a relatively long time.

The transformation of the nitrogen of the other more or less related substances of koufri is said to depend upon a number of factors, among which the nature of the organic matter contained in them, the nature and reaction of the soil, the quantity of koufri used, the duration of the plants fertilized, and the conditions of climate, drainage, and irrigation are the most important. The quantity, nature, and proportion of the salts contained in the soil and in the koufri are also factors.

Experiments with a number of samples of koufri showed that in some cases the organic nitrogen content is entirely unavailable. This is ascribed mainly to the presence of toxic salts in large amounts. Where these salts are diluted in the soil or are leached out by drainage and irrigation, a part of the organic nitrogen may be nitrified. Thus, ultimately a more or less important fraction of the organic nitrogen of koufri becomes available which varies between 4 and 11 per cent in a month and a half and between 8 and 21 per cent in two months.

The nitrification of this organic nitrogen begins and proceeds very slowly. The average value of the organic nitrogen of koufri is estimated to be from 5 to 10 per cent of that of sodium nitrate.

The experiments showed that marog and tafla contain so little organic nitrogen as to be of negligible importance.

The utilization of nitrogen in soils and fertilizers as affected by lime, J. G. Lipman and A. W. Blair (*Indus. and Engin. Chem., 16 (1924), No. 4, pp. 373–375*).—A brief review is given of experiments begun at the New Jersey

Experiment Stations in 1898 for the purpose of studying certain phases of the nitrogen problem as related to crop production. The nitrogenous materials used were sodium nitrate, ammonium sulphate, dried blood, and cow manure. For the first ten years the nitrogen treatments were run in triplicate with uniform lime treatment for all. Beginning with the second 10-year period they were divided into three groups, those in the first group receiving no lime, those in the second receiving 2 tons of ground limestone per acre at intervals of 5 years, and those in the third group being limed as in group 2 and in addition receiving a certain amount of nitrogen through legumes twice during the 5-year period.

The results indicate that the continued use of ammonium sulphate without lime has produced a soil so acid as practically to inhibit growth. The corresponding limed soils have yielded normal crops. Heavy applications of manure tended to correct the unfavorable conditions brought about by the continued use of ammonium sulphate without lime.

The results indicate further that denitrification does not take place in a normal soil, even when sodium nitrate is used in combination with moderately heavy applications of manure.

The recovery of nitrogen by the crop from applications of cow manure and of one of the commercial forms of nitrogen was usually equal to or greater than the sum of the recoveries from these materials when they were used singly.

The proportion of nitrogen in the dry matter was found to be influenced in some cases by the nitrogenous materials used and also by the presence or absence of lime and of legume green manure crops. The total nitrogen in the crop is apparently quite definitely influenced by the lime treatment and also by legume green manures used in combination with lime.

The preparation and chemical nature of calcined phosphate, E. W. GUERNSEY and J. Y. YEE (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 228–232, figs. 4*).—In a contribution from the U. S. D. A. Fixed Nitrogen Research Laboratory, the results of a series of experiments with a small rotary kiln made to determine the optimum conditions for the preparation of calcined phosphate are reported.

This material is made by heating a mixture of phosphate rock, an alkali salt, and carbon to a comparatively high temperature. It is a dry powdery material which may be stored indefinitely without change. It contains from 25 to 30 per cent of phosphoric acid, of which practically none is water soluble but the greater part of which is soluble in ammonium citrate solution. It is weakly alkaline, and hence has the advantage over acid phosphate that it can be used in mixed fertilizer with calcium cyanamid without reaction.

It was found that with a charge of 100 parts phosphate rock, 15 parts sodium sulphate, and 15 parts powdered coal, 90 per cent of the total phosphoric acid of the phosphate rock could be made citrate soluble by heating at 1,300° C. for from 25 to 30 minutes. With a charge consisting of 100 parts phosphate rock, 10 parts sodium sulphate, and 15 parts carbon, a conversion of 85 per cent of the phosphoric acid could be obtained under the same conditions.

The conversion of the phosphoric acid to a citrate soluble form is shown to be due in large part to a breaking down of the physical structure of the rock. A theory is offered to account for this action. It is considered probable that the manufacture of calcined phosphate is commercially feasible.

Potassic fertilizers [trans. title], L. HAUMMONT (*Bul. Agr. Algérie, Tunisie, Maroc, 2. ser., 30 (1924), No. 5, pp. 105–115*).—Studies with various crops on different soils are briefly reported, showing that crude potash salts are suitable for light soils and give good results on medium soils. Concentrated potash salts are particularly suited to heavy soils. The use of crude salts on heavy soils is considered inadvisable since they favor hardening of the surface soil. Concentrated salts are generally more suitable than crude salts for soils deficient in lime, although no great importance is attached to this since soils deficient in lime must be limed before they can be brought to a state of productive fertility. While the resulting loss of lime is a little less when potassium sulphate is used than with potassium chlorid, it is thought that the same principle applies for soils deficient in lime as when crude and concentrated salts are under consideration.

Potash from kelp.—VIII, Certain equilibria used in the manufacture of potassium chloride from kelp brines, J. W. TURRENTINE and H. G. TANNER (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 242–248, figs. 7*).—In a further contribution from the U. S. D. A. Bureau of Soils and the University of Oregon (E. S. R., 48, p. 713), a discussion is given of the theory on which is based the manufacture of potash salts from kelp. It is shown how, from an understanding of the equilibria involved, the theoretical efficiency of the method of recovering potassium chlorid may be calculated.

Methods of calculating concentrations and compositions are developed and applied, permitting the determination of equilibria both practical and speculative. These are employed in showing the elasticity of the system and the optimum conditions for the operation of an evaporator and vacuum crystallizer.

Gypsum and sulfur as fertilizers for legumes, J. L. ST. JOHN and J. R. NELLER (*Washington Col. Sta. Pop. Bul. 128 (1924), pp. 3–11*).—The results of studies conducted on the use of sulfur as a fertilizer by the station since 1909 are briefly summarized. These have shown that the soils contain a comparatively small amount of sulfur, and that crops use more sulfur than previous investigations had indicated. Rain does not supply sufficient sulfur for crop needs in eastern Washington.

Greenhouse and field experiments have shown that gypsum and sulfur frequently give increases, and sometimes striking increases, in the yields of alfalfa and other legume crops. Sulfur fertilizers can most profitably be applied to old seeding alfalfa in the spring. Too large applications of sulfur fertilizers should not be made.

The value of sulfur in soil improvement and crop production, J. G. LIPMAN (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 250–252*).—In a contribution from the New Jersey Experiment Stations, a brief summary is given of the results of studies conducted on the use of sulfur in soil improvement and crop production. Attention is drawn to the value of elemental sulfur as a plant nutrient, for the correction of undesirable conditions in alkali soils, and for making soluble phosphates and potassium compounds.

Data are also presented to show that commercial flour sulfur ground to pass 200, 80, and 20 mesh sieves is effective in the order given in controlling potato scab.

Activated sludge—its manufacture and fertilizing value, V. H. KADISH (*Amer. Fert., 60 (1924), No. 13, pp. 78–81*).—A brief description of the manufacture and general nature of activated sludge is presented, together with a brief account of experiments on its fertilizing value conducted at the Wisconsin Experiment Station.

Utilization of hair and leather in the manufacture of commercial fertilizers, J. A. SKOOGLUND (*Jour. Amer. Leather Chem. Assoc., 19 (1924), No. 1, pp. 11–14*).—This is a brief description of what is recognized as a fairly well standardized process for the conversion of the two by-products, hair and leather trimmings, into fertilizer. It is stated that on a small scale it has been possible to make over 90 per cent of the total nitrogen content of these materials available for use by plants.

Commercial fertilizers, E. G. PROULX ET AL. (*Indiana Sta. Bul. 280 (1924), pp. 59, fig. 1*).—Guaranties and actual analyses of 1,325 samples of fertilizers and fertilizer materials collected for inspection during 1923 in Indiana are presented.

AGRICULTURAL BOTANY.

Structural units of starch determined by X-ray crystal structure method, O. L. SPONSLER (*Jour. Gen. Physiol., 5 (1923), No. 6, pp. 757–776, figs. 7*).—The method here used consists in measuring the angle at which X-rays are reflected from a crystal, and computing from that measurement the distance between the planes of atoms which have caused the reflection.

"The presence of lines on the negatives indicates a regular arrangement of the planes of atoms. The lines are in close agreement with lines which would be produced by a lattice of the tetragonal system, the elementary cell of which is a square prism with the dimensions 5.94×5.94×5.05 Ångström units. The unit of the lattice occupies a space equal to the volume of the starch group, $C_6H_{10}O_5$. The large number of atoms in the unit makes it highly probable that principal planes and secondary planes of atoms occur for every reflecting position. The effect of the secondary upon the principal planes may readily account for the differences in the density of the lines produced on the negatives. From theoretical considerations, reflections, such as those obtained, would occur if starch grains were built up of concentric layers of units. Two other factors which might affect the density of the lines are thermal agitation and the curvature of the concentric layers. . . .

"If the interpretation of the data is correct and if the assumptions made are sound, then the starch grain is built up of units arranged in concentric layers, and the units are groups of atoms, each containing 6 carbon, 10 hydrogen, and 5 oxygen atoms. Such a structure is certainly not an amorphous structure, and on the other hand it is not crystalline in the common sense of the term. Parts of the grain, it is true, act as crystals in that for certain distances the layers of units are in planes, but taken as a whole the layers are curved. . . .

"In conclusion, the assumption that the units form a sort of spherical space lattice gives a picture of the starch grain which leads us to ponder over the nature of the activity in protoplasm when it is depositing solid substances. Starch, cellulose, and pectic bodies are about the only solid deposits made directly by the living substance of plants, and all three have the same proportional formula, $C_6H_{10}O_5$. Investigations, as yet incomplete, indicate that cellulose also consists of a regular arrangement of $C_6H_{10}O_5$ groups, each acting as a unit, but the spacing (6.14×6.14×5.55) is slightly different from that of starch. . . .

"Finally, problems in polarized light may receive more satisfactory explanations through a clearer notion of the molecular structure of the carbohydrates."

Studies on the potato tuber, E. ARTSCHWAGER (*Jour. Agr. Research* [*U. S.*], *27 (1924), No. 11, pp. 809–836, pls. 10, figs. 8*).—Anatomical and other studies of the development of the potato tuber are reported to show that the potato tuber is morphologically a modified stem with its axis greatly shortened and its lateral members weakly developed, the latter forming what are known as the potato eyes.

An attempt was also made to group some of the principal varieties of potatoes according to the anatomical structure of the tubers.

Experimental researches on vegetable assimilation and respiration, XV, XVI, G. E. BRIGGS (*Roy. Soc.* [*London*], *Proc., Ser. B, 94* (*1922*), *No. B 656, pp. 12–19, 20–35*).—Previous papers of this series (E. S. R., 45, p. 428) have been noted.

XV. *The development of photosynthetic activity during germination of different types of seeds* (pp. 12–19).—"In the case of seedlings of plants such as Helianthus, where the first assimilating organ is one that also serves as a storage organ, the photosynthetic activity, whether measured when light or when temperature is limiting, is fully developed at germination. Here with this type, assimilation under natural conditions of growth in the field shows no lag behind greening.

"In plants such as Phaseolus, Ricinus, and Zea, where the seedling develops a specialized photosynthetic organ different from the storage organ, the photosynthetic activity is not developed until some time after germination, and assimilation under natural conditions shows a corresponding lag."

XVI. *The characteristics of subnormal photosynthetic activity resulting from deficiency of nutrient salts* (pp. 20–35).—"When grown as a series of water cultures, each deficient in one or other of the essential nutrient salts, plants of *Phaseolus vulgaris* all show a lowered photosynthetic activity. Comparison of the characteristics of this state with those of the lowered activity, due to old age, suggests that subnormal photosynthetic activity in general depends upon reduction of the effective chloroplast surface, and that the magnitude of this reacting surface must be a factor of fundamental importance in the quantitative determination of assimilation."

To determine the effect of deficiency of nutrient salts a plant was chosen with a good initial store of food, so that, when grown on nutrient solution devoid of a particular element, the effects of a slight shortage of this element could be investigated. Bean plants of which the assimilation had been investigated from several other points of view were selected as suitable for this work, which is presented in tabular detail, with discussion.

"The photosynthetic activity of plants of *P. vulgaris* grown on culture solutions devoid of potassium, magnesium, iron, or phosphorus is less than that of plants grown on full culture solution. When the second leaves appear the activity of the latter also is less than that of plants grown in soil. The activity is shown to be depressed in each case to the same extent when light is limiting as when temperature is limiting.

"Other cases of such a coincidence are quoted from literature, namely, seasonal change in cherry laurel, yellow varieties as compared with green, developing seedling leaves of certain plants, and developing leaves on more or less mature plants of *Helianthus annuus*. Moreover, not only is the photosynthetic activity subnormal when light and when temperature are limiting, but evidence is produced that such is the case when carbon dioxid is limiting.

"A conception of the nature of the photosynthetic process is put forward to explain the above facts. The chief point in the conception is that the factor inside the leaf which is involved in the process is the amount of 'reactive chloroplast surface.' This is not necessarily the same as the actual chloroplast surface. Increase in the amount of 'reactive surface' will involve a corresponding increase in the photosynthetic activity when a given temperature is limiting, and under ideal conditions a corresponding increase when a given intensity of illumination or partial pressure of carbon dioxid is limiting. It is pointed out that the conditions in the leaf are not always necessarily ideal."

Theory of regeneration based on mass action, J. Loeb (*Jour. Gen. Physiol., 5 (1923), No. 6, pp. 831–852, figs. 12*).—"When a living organism is mutilated, some new growth will generally ensue which would not have occurred without mutilation. . . . If . . . we disregard the idea of specific organ-forming substances for the present, focusing our attention on the relation between the measurable quantity of dry matter of the old plant and the quantity of dry matter regenerated in a given time, the law of mass action makes it possible to correlate the mutilation with the process of regeneration. Some of the experiments on which this conclusion is based have already been published [E. S. R., 46, p. 128], and it is intended in this paper to make the proof more complete. . . .

"The regeneration of an isolated leaf of Bryophyllum is determined by the mass of material available or formed in the leaf during the experiment, and such a growth does not occur in a leaf connected with a normal plant for the reason that in the latter case the material available or formed in the leaf flows into the stem where it is consumed for normal growth. It is shown that the sap sent out by a leaf in the descending current of a stem is capable of increasing also the rate of growth of shoots in the basal parts of the leaf when the sap has an opportunity to reach the anlagen for such shoots. . . .

"It is suggested that the polar character of the regeneration in a stem of Bryophyllum is primarily due to the fact that the descending sap reaches normally only the root-forming tissues at the base of the stem, while the ascending sap reaches normally only the shoot-forming anlagen at the apex of the stem. This suggestion is supported by the fact that when the anlagen for shoots and roots are close together, as they are in the notch of a leaf, the sap of the leaf causes the growth of both roots and shoots from the same notch and the influence of the sap of the leaf on this growth increases for both roots and shoots in proportion with the mass of the leaf."

The composition of the cell sap of the plant in relation to the absorption of ions, D. R. Hoagland and A. R. Davis (*Jour. Gen. Physiol., 5 (1923), No. 5, pp. 629–646, fig. 1*).—The authors have studied the vacuolar sap obtained from individual plant cells, using the fresh water alga Nitella (*N. clavata*) for this purpose. This paper is primarily concerned with the lower salt concentrations, such as are found in culture and soil solutions favorable to the growth of common plants.

"Chemical examination of the cell sap of Nitella showed that the concentrations of all the principal inorganic elements, K, SO_4, Ca, Mg, PO_4, Cl, and Na, were very much higher than in the water in which the plants were growing. Conductivity measurements and other considerations lead to the conclusion that all or nearly all of the inorganic elements present in the cell sap exist in ionic state. The insoluble or combined elements found in the cell wall or protoplasm included Ca, Mg, S, Si, Fe, and Al. No potassium was present in insoluble form. Calcium was predominant. The hydrogen-ion concentration of healthy cells was found to be approximately constant at pH 5.2. This value was not changed even when the outside solution varied from pH 5.0 to 9.0.

"The penetration of NO_3 ion into the cell sap from dilute solutions was definitely influenced by the hydrogen-ion concentration of the solution. Penetration was much more rapid from a slightly acid solution than from an alkaline one. It is possible that the NO_3 forms a combination with some constituent of the cell wall or of the protoplasm. The exosmosis of chlorin from Nitella cells was found to be a delicate test for injury or altered permeability.

Dilute solutions of ammonium salts caused the reaction of the cell sap to increase its pH value. This change was accompanied by injury and exosmosis of chlorin. Apparently the penetration of ions into the cell may take place from a solution of low concentration into a solution of higher concentration. Various comparisons with higher plants are drawn, with reference to buffer systems, solubility of potassium, removal of nitrate from solution."

The behavior of chlorides in the cell sap of Nitella, M. Irwin (*Jour. Gen. Physiol., 5 (1923), No. 4, pp. 427, 428*).—A method is given for determining the chlorid content in a drop of the cell sap.

"Chlorids accumulate in the sap to the extent of 0.128 M; this accumulation can be followed during the growth of the cell. The chlorid content does not increase when the cell is placed for 2 days in solutions (at pH 6.2) containing chlorids up to 0.128 M. The exosmosis of chlorids from injured cells can be followed quantitatively. When one end of the cell is cut off a wave of injury progresses toward the other end; this is accompanied by a progressive exosmosis of chlorids."

Exosmosis in relation to injury and permeability, W. J. V. Osterhout (*Jour. Gen. Physiol., 5 (1923), No. 6, pp. 709–725, figs. 4*).—Since death involves exosmosis of substances from the cell it was considered probable that if exosmosis could be accurately measured one might be able to follow the progress of death with sufficient exactness to afford a satisfactory basis of comparison with the results obtained from measurements of electrical conductivity, and that at the same time direct evidence might be gained regarding the changes in permeability which accompany death.

The measurement of exosmosis by analyzing the solution which surrounds the cell involves difficulties which may be avoided by determining the concentration of dissolved substances in the cell. This can be done in a satisfactory manner in the case of Nitella, whose sap can be obtained without contamination. Since the determination of chlorids in the sap by the method described by Irwin, noted above, proved to be convenient and sufficiently accurate, this method was employed for the measurement of exosmosis in these experiments.

It was found that the time curve expressing the increase in the permeability of Nitella during the progress of death is practically the same whether derived from measurements of exosmosis or of electrical resistance.

An inquiry into the cause of bud and boll shedding in cotton, P. S. Jivanna Rao (*Madras Agr. Dept. Yearbook 1922, pp. 1–23, figs. 3*).—From the work outlined in this paper, confined to *Gossypium herbaceum* (Uppam cotton) growing at Coimbatore, it is concluded that "the shedding whether of the bud or flower or boll is brought about in a critical condition of the flower when it is unable to absorb enough water owing to the low osmotic strength of the sap in the growing portions. . . . It is significant that the later stages of bud and boll are not subject to such shedding, which must be accounted for by the superior osmotic pressure they possess for obtaining the sap.

"Boll shedding arises as a consequence of ineffective fertilization or its failure. The problem is bound up with the question how far the plant pays the penalty for self-pollination." The views of other investigators are cited and appraised.

A note on pollen sterility and the shedding of bud and fruit in Thespesia populnea, P. S. Jivanna Rao (*Madras Agr. Dept. Yearbook 1922, pp. 23–27*).—The author has found extensive shedding in *T. populnea*, brought about by vegetative propagation. He considers this a case of sterility from impotence of pollen and offers the following interpretation:

"The number of fully matured pollen grains being extremely small, the chances of a larger number of potent grains reaching the stigma, preferably from another flower, are very much reduced. In the plenitude of vegetative growth a corresponding increase in growth takes place of the style and stigma much to the disadvantage of the pollen grains, very few of which are at their highest osmotic activity. There is, so to speak, an osmotic dilution of the pollen grains on the one hand and of the pistil on the other which prevents effective fertilization. It also accounts for the dropping of buds under circumstances similar to those explained for cotton."

Anaesthesia in plants, D. A. HERBERT (*Philippine Agr., 11 (1922), No. 5 pp. 141–149*).—Support is given by experiments with *Mimosa pudica* to Haberlandt's theory of transmission, namely, that stimuli may be divided into the two types of simple response produced, for example, by mechanical shock and properly controlled chemical stimuli and injury due to mechanical, chemical, and other agencies.

"The first type is too feeble for rapid transmission, but the second is rapidly conducted. Leaves indirectly affected by a transmitted stimulus behave like leaves which have shown simple response. Rate of transmission and time of duration of the effects of the stimulus are directly proportional to the amount of stimulus.

"Chloroform and ether do not narcotize Mimosa. Their effect is similar to that of more violent poisons such as ammonia, hydrogen sulphid, and sulphur dioxid, but differs in degree. Properly regulated amounts of these substances produce simple response, but in excess they produce an injury stimulus. Anesthesia is not produced in plants by the use of gases which produce this phenomenon in animals.

"In the presence of small amounts of these gases an excitatory fall is first produced, but the leaf reerects itself and the time taken is the same as that in the case of simple stimulus. Where the effect is prolonged it is found that injury has been produced, and complete recovery does not take place."

Freezing and death by cold in plants [trans. title], BERTHOLD (*Beitr. Pflanzenzucht, No. 5 (1922), pp. 71–82*).—Differences in resistance to cold, and their practical bearings, are discussed, several references to the literature of the subject being indicated.

Varietal differences in the resistance of cabbage and lettuce to low temperatures, R. B. HARVEY (*Ecology, 3 (1922), No. 2, pp. 134–139, figs. 6*).—"It was the purpose of this study to determine if varietal differences in hardiness can be placed on an exact basis. . . .

"An exact method for testing the ability of plants to harden is given, and applications for it are suggested. Using this method, the relative injury to varieties of cabbage and lettuce at low temperatures is shown to be dependent upon varietal differences in the ability of these plants to harden."

Conditions indirectly affecting vertical distribution on desert mountains, F. SHREVE (*Ecology, 3 (1922), No. 4, pp. 269–274, figs. 2*).—"The object of this paper is to describe . . . cases in which the variety of the earth's surface so greatly modifies the vertical gradients of physical conditions that dissimilar communities of plants and animals may be found at the same altitude in adjacent localities."

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from July 1 to September 30, 1922 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 72 (1924), pp. III+42, pls. 5*).—Economic notes are given of 245 lots of seeds and plants introduced for testing in the United States.

Phanaerogamic root parasites, D. A. Herbert (*Philippine Agr., 12 (1923), No. 6, pp. 221–223*).—"The main points for consideration are whether the haustoria are modified roots, and whether they are produced in the absence of host plants or whether they need contact of chemical stimulus before they are produced. . . .

"The results go to show that in the majority of cases there is no discrimination on the part of parasite, but that in some cases there is. In the latter case the chances of any particular plant of reaching maturity are small, for it may not find its host and must therefore die. Self-parasitism is common in seven of the species mentioned. It is often the simplest way of demonstrating the parasitic nature of the particular plant being investigated, as near the base of the plant the roots are fairly congested and generally some are in close contact with others. If self-parasitism takes place, as it does with most species, it will be found there, and where self-parasitism takes place, parasitism on other species is always found. Investigation is needed in the case of families closely related to the Loranthaceae and Olacaceae to see whether it is restricted to particular families or whether it is a more or less general rule through families closely related to these two."

The parasitism of Olax imbricata, D. A. Herbert (*Philippine Agr., 11 (1922), No. 1, pp. 17, 18, fig. 1*).—*O. imbricata* is parasitic on several hosts, but its haustoria attain their best development on its own roots.

GENETICS.

On the relationship between stature and the length of the appendages in man, J. A. Harris (*Amer. Nat., 58 (1924), No. 656, pp. 254–271, figs. 4*).—Based on the data of Boas and Wissler[3] and Schuster,[4] the author has made a statistical study of the relation between stature and the length of the upper and lower appendages of children and adults of both sexes. The correlations found were relatively high, but the correlation indicating the relationship between stature and the deviation of its components (sitting height and leg and thigh lengths) from their probable values show that leg length forms a relatively larger portion of total stature in tall individuals than in shorter ones. The relationship between stature and the deviation of the length of the upper appendages from their probable value was relatively small and in some cases not significant, but prevailingly negative.

Chromosome behavior in Acer platanoides L., C. A. Darling (*Amer. Jour. Bot., 10 (1923), No. 8, pp. 450–457, pls. 2*).—"Chromatin masses corresponding in number to the chromosomes at the time of cell division are present in the various stages of the vegetative cells and of the reproductive cells in *A. platanoides*. These chromatin masses may be followed through synapsis, in which stage they become closely paired and unite end to end. The chromatin threads are formed by a flowing out of the chromatin material from the chromatin masses. The chromosomes do not lose their individuality in passing through the telophase stages to the resting stage of the nucleus."

The "Gromet" pattern in sheep, C. Wriedt (*Jour. Heredity, 15 (1924), No. 3, pp. 124–126, figs. 2*).—The author has studied the inheritance of the Gromet pattern in sheep (a gray mottled face, with black over the eyes, bridge of the nose, and on the lips), and has found that this condition behaves as a normal recessive to white and probably to black-face. The study was made from the records of several Norwegian breeders.

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[3] U. S. Bur. Ed., Rpt. Commr. Ed., 1904, I, p. 25–132.

[4] Biometrika, 8 (1911), No. 1–2, pp. 40–51.

Albinism in barley, G. A. WIEBE (*Jour. Heredity, 15 (1924), No. 5, pp. 220–222, fig. 1*).—Plants producing albino seedlings were found in an F_3 head row of Nepal×many-noded dwarf barley (E. S. R., 48, p. 832). Genetic study of the normal plants in rows showing albino seedlings indicated that albinism in barley behaves as a simple Mendelian recessive. No defective endosperms could be found in either the normal or the albino-producing seedlings.

A biometrical analysis of characters of maize and of their inheritance, T. K. WOLFE (*Virginia Sta. Tech. Bul. 26 (1924), pp. 5–70, figs. 26*).—These investigations are considered in three parts.

I. *A study of ear and plant characters of maize.*—Statistical studies of certain ear and plant characters in corn were made in order to analyze more thoroughly the inheritance of these characters and to determine their interrelations. Boone County White corn and Silver King corn were used in the study of ear and plant characters, respectively.

The means of the ear characters of the high yielding strains of Boone County White and those of the characters of the marketable ears of the low yielding strains, as a rule, were greater than those of the low yielding strains in this variety. No pronounced differences were observed between means of the low yielding strains and a composite random sample from the low yielding strains. The characters of the marketable ears varied least, and were followed in order by the high yielding strains, random samples, and low yielding strains.

The most variable ear characters were tip value, butt value, weight of grain, length of ear, and average length of kernel, and the least variable was the percentage of grain. Plant characters varying most were weight of cob, weight of grain, weight of stalk, height of stalk below the ear, and number of nodes below the ear, and varying least were days to silking and to tasseling. Weight of grain per ear was correlated positively and significantly with all other characters except the ratio of butt circumference to tip circumference, where either no relation or that weight of grain decreases with an increase of cylindricity of the ear was indicated. Percentage of grain increased as length of kernel increased but declined with an increase in the diameter of the cob. Correlations of yield of grain per stalk with days to tasseling and to silking indicate that the plants flowering late within a given variety produce less grain than those flowering earlier. A marked correlation of yield of grain per stalk was seen with weight of cob, weight of stalk, and circumference of stalk.

A random sample will probably give as reliable conclusions as will the entire sample from which it is taken. High or low yielding strains of corn apparently can not be distinguished by the use of the score card alone, but the score card may be of value in selecting high yielding ears within strains.

II. *The inheritance of characters of maize as influenced by hybridization.*—The inheritance of certain characters was studied in the P_1, F_1, and F_2 generations of Alvord Dent × Cornell No. 12 and Narrow Leaf × Cornell No. 12. Days to pollen maturity showed a significant positive correlation only with number of nodes per plant in all generations studied in Alvord Dent × Cornell No. 12. Weight of grain per stalk in the three generations was positively and significantly correlated with all the characters studied except days to pollen maturity. These and other results suggested that late maturing, high yielding plants are those that tassel, silk, and mature pollen early in the period of growth.

In Alvord Dent × Cornell No. 12 about the same degree of correlation existed between the characters when correlated with either pollen maturity or yield per plant in the P_1, F_1, and F_2 generations, whereas in Narrow Leaf × Cornell No. 12, a closer correlation was found in Cornell No. 12 between weight of grain per stalk and various characters studied, than in Narrow Leaf or in the two hybrid generations. The mean values of the F_1 of both hybrids were generally greater than those of the parents or the F_2. The most variable characters in both crosses were weight of stalk, weight of grain, and weight of cob.

III. *Inheritance of correlated characters.*—Although yield per plant and circumference of stalk were highly correlated in the studies reported in part 1, in further investigations the differences in yield between seed of Silver King borne by small circumference plants and by large circumference plants, whether the seed were selfed or cross-pollinated, were so slight as to be unimportant.

The partial genetic independence in size of the various parts of the body, F. B. SUMNER (*Natl. Acad. Sci. Proc., 10 (1924), No. 5, pp. 178–180*).—This and the following paper are continuations of the discussion between the two authors previously started over Castle's paper dealing with the operation of factors controlling size (E. S. R., 49, p. 366). Evidence is presented, based on experiments with Peromyscus and the work of Hammett, to indicate that special size factors are operative in controlling the size of individual parts which materially influence total size.

Are the various parts of the body genetically independent in size? W. E. CASTLE (*Natl. Acad. Sci. Proc., 10 (1924), No. 5, pp. 181, 182*).—This is a reply to the above paper in which the author further emphasizes his position in regard to the operation of general size factors. He concludes that he has demonstrated that "in rabbits the only genetic agencies of any consequence which affect size are those which affect size generally."

Measurement of linkage values, G. N. COLLINS (*Jour. Agr. Research [U. S.], 27 (1924), No. 11, pp. 881–891*).—The author discusses three general methods that have been proposed for measuring linkage values in the F_2 population: Yule's coefficient of association, Q; Emerson's method, P; and Haldane's method, T. Yule's method is considered to most nearly meet the requirements of a general method, and a formula is given for evaluating the degree of linkage from observed values of Q.

Maleness and femaleness in sheep (trans. title), M. LAPLAUD and A. GARNIER (*Rev. Zootech. [Paris], 3 (1924), Nos. 3, pp. 164–168; 4, pp. 256–265, figs. 3*).—This is a summary of the numbers of males and females born in the flock at Vaulx-de-Cernay from 1904 to 1921. Though larger numbers of males or females occurred in certain years, the sexes were approximately equal in number, and the total of twin males and twin females was approximately equal to the combined numbers born as male and female twins.

The inheritance of flower types and fertility in the strawberry, W. D. VALLEAU (*Amer. Jour. Bot., 10 (1923), No. 5, pp. 259–274*).—Consideration of data and inferences from work now discontinued "leaves little doubt that the males and hermaphrodites are homozygous for sex chromosomes bearing functional male determiners. The females, on the other hand, must be assumed to possess one sex chromosome carrying a male or hermaphrodite determiner, and another chromosome carrying the female determiner. In other words, we have a condition similar to that existing in pigeons and cultivated fowl in which the males are apparently homozygous and the females heterozygous for the sex determiners. The condition is opposite to that which has been found to exist in the females of Bryonia, Lychnis, sweet pea, and Vitis. In view of the fact that either males or females may be heterozygous in the animal kingdom, it is not surprising that both types should be found in plants."

The author does not believe that the presence of other sex types of flowers on a plant predominantly of one sex necessarily means that sex is not determined by specific factors, or that such a condition is an argument against a Mendelian interpretation of sex in plants. It is not difficult to suppose that in certain parts of a plant conditions may set up having a tendency to decrease the suppression of factors already present and to allow flowers or flowering parts of the opposite sex to be produced on a given plant. "The determiners for sex in plants may be specific entities, but still their full or partial expression may depend upon the immediate conditions surrounding them at the time of flower production."

Experimental studies on the duration of life.—X, The duration of life of Drosophila melanogaster in the complete absence of food, R. Pearl and S. L. Parker (*Amer. Nat., 58 (1924), No. 656, pp. 193–218, figs. 6*).—In continuing this series of studies (E. S. R., 51, p. 128), the length of life of vestigial and Old Falmouth flies has been studied in the complete absence of food.

In making the study, 650 special glass tubes were started on May 3 with 3 pairs of flies each. Three hundred of the tubes were of the Old Falmouth and 350 of vestigial stock. The food and parents were removed on May 12, leaving only the pupae on the sides of the tubes. When the flies began to emerge they were removed at 6-hour intervals and placed in 1 oz. vials in densities of 5, 50, and 100 flies per vial. The length of life was determined for the following numbers of wild and vestigial flies, respectively, at the different densities: Five per vial 555 and 577, 50 per vial 583 and 610, and 100 per vial 641 and 666 flies. The following table gives a summary of the results obtained for the combined sexes:

Biometric constants for duration of life of starved flies, sexes combined.

Numbers examined per vial.	Mean length of life.		Standard deviation.		Coefficient of variation.	
	Wild type.	Vestigial.	Wild type.	Vestigial.	Wild type.	Vestigial.
	Hours.	*Hours.*	*Hours.*	*Hours.*	*Per cent.*	*Per cent.*
5	44.77±0.25	46.36±0.29	8.84±0.18	10.19±0.20	19.76±0.42	21.97±0.46
50	44.60± .28	47.20± .30	9.85± .19	11.11± .21	22.08± .46	23.53± .48
100	47.59± .26	48.51± .25	9.88± .19	9.53± .18	20.75± .41	19.64± .38

The more outstanding results, as pointed out by the authors, were that the duration of life for both strains was practically the same in complete starvation, whereas the expectation with food is nearly three times as long for the wild as for the vestigial flies. The coefficient of variability was also relatively much lower under starvation than with normal feeding, previous experiments having shown variabilities all over 20 per cent. As with food, the females were found to have a slightly longer duration of life than do the males, and the variability of the females was also greater. The slight differences in the length of life at the different densities under starvation indicated that the larger differences observed in fed flies at such densities are directly connected with feeding.

A comparison of the form of the life curves of the wild flies on a centile age base showed that the form of the life curve was substantially the same for both fed and starved flies. The curves for starved and fed vestigial flies were widely different, however, as the curve of the starved flies closely approached that of the wild type, while the peculiarities of the curve for fed vestigial flies have been pointed out in earlier papers. This tends to indicate that normal laboratory feeding conditions do not permit vestigial flies to realize their full potentialities in respect to duration of life.

The genetic significance of these results is pointed out by showing how the environment may operate in retarding or aiding the expression of genetic factors. The gene which has been shown to reduce the length of life of vestigials when fed is not able to operate under conditions of starvation, though the genetic factors making for longer length of life of females are not changed relatively.

The influence of nutrition in causing lasting alterations in plants [trans. title], P. EHRENBERG (*Beitr. Pflanzenzucht, No. 5* (*1922*), *pp. 45–71*).—The first of the two main portions of this article deals with the relations of nutrition to sporadically hereditary changes in plants, and the second with such relations to the hereditary changes (mutations) in the stricter sense.

Some effects of physiological conditions on genetic characters of wheat, W. F. GERICKE (*Amer. Jour. Bot., 10* (*1923*), *No. 6, pp. 275–277*).—A brief preliminary report of tests made shows that relatively simple alterations in the physiological condition produced profound effects in determining relative earliness or lateness of certain wheat varieties.

Note on the colour changes in rats' fur produced by alterations in diet, G. A. HARTWELL (*Biochem. Jour., 17* (*1923*), *No. 4–5, pp. 547, 548*).—Several lots of dark colored rats fed on diets of bread and whole milk with and without vegetable kitchen scraps at the King's College for Women changed to a gray-fawn color about three weeks after the feeding commenced. No changes in coat color attributable to diet were produced during the winter months. It was found that by the addition of caseinogen, with and without other food, the dark color again developed in the hair. The author concludes that the melanin of the hair is formed from tyrosin and tryptophan.

FIELD CROPS.

Forage crops in relation to the agriculture of the semiarid portion of the northern Great Plains, R. A. OAKLEY and H. L. WESTOVER (*U. S. Dept. Agr. Bul. 1244* (*1924*), *pp. 54, figs. 18*).—The relation of cultivated forage crops to the agriculture of the northern part of the Great Plains region is considered in this publication. The region is delimited, and an account is given of its history, climate, soils, and agricultural resources. Experimental data are tabulated and discussed showing the forage yields of corn fodder; sorghum varieties; corn and sunflowers for silage; alfalfa varieties; alfalfa seeded broadcast, in rows, and in drills, receiving different cultural treatments, with and without a nurse crop, and in comparison with brome grass and brome grass-alfalfa mixture; millet varieties; Sudan grass in rows, drilled, and broadcast; sweet clover in rows, drilled, and with nurse crops; field pea varieties and field peas mixed with grain; and miscellaneous grasses and clovers, grain hay, and root crops and the seed yields of soy bean varieties. These data were obtained from tests at various points in the northern Great Plains conducted by this Department independently and in cooperation with the State experiment stations.

Cereals are the chief crops, although forage, particularly native grasses, contributes largely to the agricultural resources by making stock raising possible. The acreage of cultivated forage crops is slightly more than half that of native grasses cut for hay. The precarious conditions under which crop production is attempted in the drier parts of the region require livestock to stabilize the farm income. The native ranges and hay lands must be supplemented by cultivated forage crops if stock raising is to become an important modification of grain farming.

Alfalfa, corn, and grain hay are the most important forage crops of the region. Sorghum is grown extensively in northern Nebraska and southern South Dakota. Awnless brome grass and sweet clover are prominent crops, and millets are used to some extent as emergency crops, while only limited areas of field peas, soy beans, and root crops are grown. The most hopeful means of improving the ranges seems to be through the introduction of exotic plants. The possibilities of the silo as a means for storing forage for indefinite periods are an important consideration.

Readjustment of the ratio of forage to grain and of the size of the farm unit, and the raising of beef cattle are suggested to provide a well balanced farming system.

Spring crops for eastern Oregon, D. E. STEPHENS, R. WITHYCOMBE, and O. SHATTUCK (*Oregon Sta. Bul. 204 (1924), pp. 3–36, figs. 14*).—The results of variety, cultural, and seeding tests with spring-sown crops at the substations at Moro in Sherman County, Union in Union County, and Burns in Harney County, Oreg., are reported on with milling and baking data for wheat varieties, and tabulations and maps showing the distribution, yield, and acre value of the small grains in Oregon. Much of this information has been noted from other sources (E. S. R., 47, p. 533; 49, pp. 525, 828).

When not injured by freezing, fall-sown grains usually are more productive and distribute farm labor better than the spring-sown grains, but under certain conditions spring seeding may be advisable. The experience of farmers on the dry lands of eastern Oregon, and results obtained on the substations show that fall-sown wheat will produce higher acre yields than spring-sown, especially after summer fallow, and that winter barley, if not injured by cold weather, will usually outyield spring barley. Winter rye grown after fallow at Moro has not been as productive as spring rye, but neither winter rye nor spring rye has yielded as much as winter or spring wheat. At the Burns Substation, spring rye has been the most dependable dry-land crop.

Among the leading varieties at Moro have been Federation, Hard Federation, and White Federation wheat; Mariout and Peruvian barley; Markton and Three Grain oats; O'Rourke, Lima, and White Canada field peas; Minnesota 13, Northwestern Dent, and Walla Walla White Dent corn; and Idaho Rural, Early Rose, and Irish Cobbler potatoes. Leaders at Burns were Federation and Baart wheat on irrigated and dry land, respectively, Trebi and Hannchen barley, Early Mountain oats, Kaiser field peas, and Early Ohio Potatoes. Prominent varieties at Union included Federation and Hard Federation wheat, Trebi and Hannchen barley, Silvermine oats, White Canada field peas, and Minnesota 13 corn.

Federation and Hard Federation wheats are expected to supplant all other spring wheat varieties in eastern Oregon. Milling and baking trials conducted by the Bureau of Agricultural Economics, U. S. D. A., showed Hard Federation to be a very satisfactory wheat for breadmaking, being better than Baart or Pacific Bluestem and about equal to Marquis. Federation grown on dry land appears to be about equal to Baart for breadmaking. When grown under irrigation, Federation seems to be somewhat superior to Dicklow as a milling wheat.

Barley has been the most productive crop for spring seeding in the region. Oats did not produce as well as barley on dry land. Field peas were particularly promising, being used successfully for pasture for hogs and sheep at each of the substations, and proving superior to the small grains in feeding tests with hogs at Union. Flax may prove profitable in certain sections in eastern Oregon. Potatoes have given fair yields under dry-farming conditions at Moro when grown after fallow.

[Agronomic investigations in Hawaii, 1922], H. L. Chung, J. C. Ripperton, F. G. Krauss, and J. F. O'Brien (*Hawaii Sta. Rpt. 1922, pp. 8–11, 14, 15, 20, 21, 22, 23, pl. 1*).—Experimental work with field crops reported on in continuation of earlier work (E. S. R., 48, p. 330) included variety tests with cassava, mangels, forage grasses, sorghum, and kale; productivity tests with miscellaneous grasses and Hubam sweet clover; and breeding work with corn, cowpeas, and sunn hemp. Plat tests of cowpeas, soy beans, pigeon pea, purple vetch, Bellingham pea, and emmer, and corn varieties were made at Haleakala Substation. Although distinct increases resulted from the application of fertilizers to Yellow Caledonia sugar cane, no relation was apparent between the amount of increase and the composition of the fertilizer applied. Acid phosphate was the only single fertilizer giving an appreciable increase, and plats receiving this material in fairly large quantities made the highest yields.

The value of the pigeon pea for Hawaii is pointed out. On soils very dry in summer and producing few crops without irrigation, greatly increased yields of the whole plant, forage, and seed of pigeon peas were obtained with irrigation. On rather unproductive raw uplands at Pupukea, with the application of 500 lbs. per acre of phosphatic fertilizer at planting, the green forage yield of pigeon peas increased from 2.61 to 13.07 tons.

[Agronomic investigations in Hawaii, 1923], H. L. Chung and J. C. Ripperton (*Hawaii Sta. Rpt. 1923, pp. 6, 7, 10*).—Supplementary to the above report are given the results of varietal trials with mangels and native and exotic sweet potatoes, the progress of improvement work with sunn hemp, and brief accounts of the flowering of Guatemala grass and Uba sugar cane. Hybrids were made between Uba and the best sugar cane varieties available.

Experiments with edible canna show that regardless of age and the fact that considerable difference exists between the mature and immature type of tubers, the chemical composition of a hill of cannas as a whole remains practically constant. The feeding value of the edible canna, both tubers and tops, is similar to that of the other common tuberous and nonleguminous forage crops. Canna starch is characterized by its unusually large granules, and its properties resemble those of potato starch. It is thought to have possibilities as an industrial starch.

[Field crops investigations in Missouri, 1922–23], W. C. Etheridge, C. A. Helm, L. J. Stadler, and J. T. Quinn (*Missouri Sta. Bul. 210 (1924), pp. 51–55, 57, figs. 2*).—Investigation during 11 years of methods of seed bed preparation for corn on deep, fertile Marshall silt loam in northwest Missouri showed that planting in a list furrow 6 to 8 in. deep, or even in a shallow furrow opened with disk planter, has invariably increased the yield of corn, giving respective acre increases of 7.4 and 4.2 bu. over surface planting. On fertile Grundy silt loam soil in northeast Missouri, late and deep cultivation apparently decreased the yield slightly in 1922. On Marshall silt loam in northwest Missouri spring plowing and shallow cultivation produced better yields than fall plowing and deep cultivation, whereas on Hagerstown silt loam in southwest Missouri spring plowing caused a reduction of nearly 7 bu. to the acre. Little or no difference between the yields from spring plowing and fall plowing was seen on Summit silt loam in central Missouri.

While kafir and sorgos have outyielded corn on upland soil in the Ozark section, a comparison in the gray prairie section of southwest Missouri did not show the same superiority.

Blackhull and selections from Michigan Wonder and Fulcaster led the wheat varieties. On gray prairie soil in southwest Missouri, land plowed early produced nearly twice as much wheat per acre as land plowed late. Variations in the subsequent treatment of land plowed either early or late had no significant effect upon yield. Harrowing soy bean stubble in preparation for wheat made 7.1 bu. per acre more than rolling, 2.7 more than rolling and disking, and 7.8 more than no treatment.

A Sterilis selection, Burt, and Fulghum were the leading oats varieties in acre yields.

The superiority of Acala, Mebane Triumph, and Cleveland cotton has been demonstrated in the southeast Missouri lowlands. On Lintonia fine sandy loam an average net profit of $6.60 per acre has accrued from the application of 300 lbs. of acid phosphate, which increased the earliness of the cotton crop about 10 per cent. No further profit followed the addition of 35 lbs. of potassium chlorid.

Continued varietal trials with soy beans have shown Virginia to be suitable for soils of medium and lower fertility, Wilson for seed and hay on central Missouri soils somewhat above the average in fertility, and Morse and Mikado for the fertile soils of northeast and northwest Missouri, respectively. In cultural tests with soy beans maximum yields accompanied plantings between May 15 and June 1, 3.5-ft. rows, 20 lbs. of seed per acre, and level and shallow cultivation. In rows 40 in. apart soy beans slightly outyielded cowpeas in both seed and hay, and when sown with an 8-in. grain drill soy beans still made slightly higher yields of hay than cowpeas and more than doubled the seed yields of cowpeas. Soy beans yielded slightly more in both seed and hay when sown with a grain drill. Cowpeas sown with a grain drill yielded far more hay but only half as much seed as when sown in 40-in. rows.

Sudan grass made highest yields when drilled at the rate of 25 lbs. per acre on average upland soil at Columbia, while at Cuba on very thin upland soil 30 lbs. gave the best returns. Sudan grass and soy beans drilled together at Columbia nearly doubled the yield of these crops sown in alternate rows 32 in. apart.

Potato studies have shown the value of fall home-grown seed for the spring crop, the practicability of growing a fall crop under average Missouri farm conditions, and the superiority of certified over noncertified northern seed.

[Field crops work in Rhode Island, 1923] (*Rhode Island Sta. Rpt. 1923, pp. 6, 7, 9*).—These pages report briefly the progress (E. S. R., 49, p. 526) of comparisons of potato varieties and hybrids and rye varieties, a seeding test with annual white sweet clover, and a fertilizer trial with corn on grass sod in rotation without manure.

Elemental composition of the corn plant, W. L. Latshaw and E. C. Miller (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 11, pp. 845–860, pl. 1, fig. 1*).—An elemental analysis of five corn plants of Pride of Saline variety grown in the field at Manhattan, Kans., in 1920, was made at the Kansas Experiment Station. The results of the analysis are tabulated and discussed, and the weights of the elements removed from the air and soil by an acre crop of corn are estimated. The following table shows the average percentage and the percentage distribution of the different elements:

Average percentage and the percentage distribution of the different elements in the leaves, stems, grain, roots, and cobs of Pride of Saline corn grown at Manhattan, Kans., in 1920.

Organ.	Elements.													
	Carbon.	Oxygen.	Hydrogen.	Nitrogen.	Phosphorus.	Potassium.	Calcium.	Magnesium.	Sulphur.	Iron.	Silicon.	Aluminum.	Chlorin.	Manganese.
	Percentage of the elements, dry basis.													
Leaves	41.27	43.86	5.86	1.30	0.21	1.48	0.47	0.21	0.24	0.07	2.59	0.07	0.22	0.04
Stems	44.51	43.90	5.90	.84	.09	1.23	.17	.16	.16	.05	.42	.01	.22	.02
Grain	44.72	45.30	6.96	2.15	.34	.42	.03	.20	.14	.04	.02	.02	.03	.04
Roots	42.31	43.58	5.72	1.27	.12	.48	.61	.17	.25	.52	4.44	.98	.11	.07
Cobs	45.75	45.89	6.36	1.38	.09	.46	.02	.11	.02	.03	1.33	.05	.12	.08
	Percentage distribution of the elements.													
Leaves	26.58	27.70	26.33	25.01	28.63	45.18	58.16	32.32	39.75	22.96	62.32	19.46	42.84	27.88
Stems	24.51	23.70	22.67	13.78	10.48	32.16	18.01	21.04	22.66	14.57	8.61	2.90	36.92	12.64
Grain	32.04	31.88	34.82	46.01	52.26	14.19	3.43	34.22	25.77	15.68	.43	6.71	7.07	35.68
Roots	7.02	7.09	9.52	6.31	4.24	3.76	19.49	6.75	10.66	44.11	27.57	66.33	5.42	14.87
Cobs	9.82	9.66	6.63	8.85	4.36	4.67	.89	5.63	1.12	2.66	1.06	4.58	7.75	8.92

The effects of fertilizers and hybridization on maturity and yield of corn, T. B. Hutcheson and T. K. Wolfe (*Virginia Sta. Tech. Bul. 27* (*1924*), *pp. 5–20, figs. 3*).—The influence of some of the ordinary commercial fertilizers, stable manure, legumes, and lime on maturity, yield, shelling percentage, percentage of marketable grain and of matured ears, and pounds of shelled corn per pound of stover was determined with corn grown in rotation and under continuous cropping on Hagerstown silt loam soil.

Acid phosphate was outstanding among the different fertilizers used alone, both in rotations and under continuous cropping. In the rotation a fertilizer combination including acid phosphate was generally more effective than either a combination omitting acid phosphate or any commercial fertilizer used alone. Under continuous cropping, phosphates alone were usually more advantageous than any combination of commercial fertilizers or any single commercial fertilizer. In the rotation the proper proportion of nitrogen, phosphoric acid, and potash appeared to be more effective in promoting growth and maturity than any single element. Soluble phosphates were much more effective than insoluble phosphates in the rotation, whereas under continuous cropping raw rock phosphate or floats seemed to be as efficient as the soluble phosphate. Stable manure demonstrated its value in both experiments. As the yield increased or decreased in the rotation, the percentage of matured ears, percentage of marketable grain, shelling percentage, and proportion of shelled corn to stover seemed to increase or decrease. Correlations between yield and the other factors were not so close under continuous cropping.

An additional year's observations on the effects of hybridization on maturity and yield in the F_1 generation of a number of varieties of corn crossed in 1915 (E. S. R., 39, p. 31) gave results in harmony with those already reported.

Korean lespedeza, a new forage crop, A. J. PIETERS and G. P. VAN ESELTINE (*U. S. Dept. Agr., Dept. Circ. 317 (1924), pp. 15, figs. 11*).—The characteristics, origin, and botanical history of Korean lespedeza (*Lespedeza stipulacea*) are discussed, a comparison is made with Japanese lespedeza (*L. striata*), and the results of cooperative tests with the crop are assembled.

As compared with Japanese lespedeza, Korean is earlier, the growth is coarser, the branchlets more woody, and the leaflets decidedly larger, broader, and of a duller, grayer green. Korean is a heavy seeder, being certain near Washington, D. C., and producing fair seed yields at Ames, Iowa. *L. stipulacea* may be of value on relatively poor acid soils and at the higher altitudes in the South. Its drought resistance suggests further trial on the eastern border of the Great Plains. The lespedeza failed when seeded with a nurse crop in Ohio, whereas a good stand followed seeding with oats in Illinois. The crop did not thrive when seeded on a heavy blue grass pasture in western Pennsylvania, while growth was satisfactory when seeded on poor blue grass sod in Ohio.

Korean lespedeza is a summer pasture crop for the poorer permanent pastures of the Northern States. It is not a hay crop and is not advised for situations in which red clover, alsike clover, or sweet clover thrive. Its value is believed to lie in the fact that it will reseed the ground and will grow in the hot months when grass on poor droughty land is brown and dead.

Sugar, E. W. BRANDES, C. O. TOWNSEND, P. A. YODER, S. F. SHERWOOD, R. S. WASHBURN, G. B. L. ARNER, O. E. BAKER, F. C. STEVENS, F. H. CHITTENDEN, C. F. LANGWORTHY, ET AL. (*U. S. Dept. Agr. Yearbook 1923, pp. 151–228, figs. 51*).—This concise account of the sugar industry in the United States, a portion of which was prepared in cooperation with the Louisiana Agricultural College, deals with its historical development; the factors influencing the culture of sugar cane and sugar beets, cultural and labor requirements, diseases and insect pests, improvement of sugar plants by breeding and selection, production costs, and manufacture of sugar from sugar cane and beets; production of sucrose by sorgo, maple, and of other sugars; and by-products of sugar manufacture. World production and movement of sugar, prices and consumption of sugar, and legislation are commented on briefly, with conclusions on the outlook for the sugar industry in the United States.

Dark tobacco fertility experiments at the Clarksville station—results from a ten-year period—1913–1922, C. A. MOOERS and R. H. MILTON (*Tennessee Sta. Bul. 129 (1924), pp. 23, figs. 8*).—Fertilizer experiments with tobacco were carried on on Clarksville stony loam soil at the Clarksville Substation in cooperation with the Bureau of Plant Industry, U. S. D. A.

The relative values of moderate applications of fertilizer, lime, and manure in a 5-year rotation of tobacco, soy beans, wheat, and clover and grass two years were determined. The maximum yields of all crops were made with the full treatment of fertilizer, lime, and manure. The next highest yields were obtained with tobacco, wheat, and clover and grass hay when lime was omitted, and soy beans when manure was omitted. Omission of the fertilizer resulted in marked reductions in all crops, although the yields therewith were greatly in excess of those obtained on untreated plats.

Three hundred lbs. of acid phosphate and 120 lbs. of sodium nitrate seemed to be the most profitable amounts of these materials for tobacco. Increased yields of both wheat and hay could be attributed to fertilizer as applied to tobacco preceding them in rotation. The yields on the fertilized plats exceeded those on the check plats and rose with the increase in application of from 0 to 300 lbs. of acid phosphate per acre. Either basic phosphate or precipitated bone may be substituted for acid phosphate on tobacco. Sodium nitrate and ammonium sulphate produced the greatest increases in yield and were the most profitable in a comparison of nitrogenous fertilizers. A definite need for potash as a tobacco fertilizer was not shown in cooperative trials in Montgomery County.

Other phases considered briefly are a comparison of two 5-year and two 3-year rotations, the time of application of manure in rotation, and a production test of alfalfa.

Rules for seed testing, M. T. MUNN (*New York State Sta. Circ. 73* (*1924*), *pp. 16*).—The rules recommended by the Association of Official Seed Analysts of North America for the testing of agricultural seed are given in full, with a table showing the characteristics of seeds of field crops.

Weeds of New Jersey, J. G. FISKE (*New Jersey Stas. Circ. 161* (*1924*), *pp. 3–36, figs. 25*).—The characteristics of 26 common weeds in New Jersey are set forth with suggested control methods and a general discussion of eradication practices and dissemination.

HORTICULTURE.

[Horticultural investigations at the Hawaii Station, 1922], W. T. POPE and J. C. RIPPERTON (*Hawaii Sta. Rpt. 1922, pp. 2–8, 13, 14, 17, pls. 6*).—As usual (E. S. R., 48, p. 338) this report is devoted largely to trials of new and important fruits. Of 26 varieties of bananas tested at the Tantalus Substation, the Chinese variety is deemed particularly desirable for planting at low elevations and in gardens. The Bluefields variety is described as a good shipping fruit, but the height of the tree renders it susceptible to wind injury. Seedlings of the Solo papaya were found in some instances to surpass the parent in quality and to come into fruiting very early; in many instances 11-month-old trees carried 40 to 70 lbs. of fruit. Propagation of the papaya is usually by cuttage, although seedlings often produce satisfactory results. The citrus orchard, improved by turning under a cover crop of mungo beans, produced abundant crops of certain varieties. A survey of native oranges yielded one variety bearing large, smooth-skinned, sweet, juicy fruits. The time of ripening was so variable among the 85 avocado varieties under test that fruit was obtained during the greater part of the year. In many cases avocado seedlings were found superior to their parents. Several recently named mangoes are described.

Tomato seedlings resulting from the hybridization of Earliana with the small native variety showed some of the superior qualities of the named parent combined with the insect-resisting capacities of the wild parent.

Pineapple fertilizer investigations begun in 1919 with the purpose of determining the effect of fertilizers on yield and on the prevention of wilt diseases showed at the close of the study in 1922 that in fertile soils, such as used in the experiment, fertilizers have no appreciable influence on yield or in the warding off of wilt.

Measurements taken in plats of the tree fern established with a view of determining the feasibility of replanting tree fern on cut-over areas as a source of starch showed an annual vertical increment of approximately 4 in. per year.

Coconuts, with a portion of the outer hull removed and the cut ends set just below the surface, germinated better in rice hulls than in coarse black sand or in coral beach sand.

[Horticultural investigations at the Hawaii Station, 1923], W. T. POPE (*Hawaii Sta. Rpt. 1923, pp. 3–5*).—A brief report upon acclimatization and cultural tests with new or promising fruits.

Of approximately 90 varieties of avocados under study some were observed to be decidedly unproductive, a condition believed due to failure in pollination, preliminary studies indicating that cross-pollination is necessary in certain varieties to assure satisfactory production, as indicated by Stout (E. S. R., 50, p. 238). A method developed by the station for propagating avocados, in which the tender terminal shoots of desirable varieties are grafted on young seedlings, is expected to greatly reduce the time required to bring young grafted trees to a transplanting age. Rootstock studies with the avocado indicated that, contrary to the local belief, the West Indian rootstock is equal to the Guatemalan, particularly when the seeds used in producing the stocks are taken from good quality fruits. Due to close consanguinity, the Guatemalan and West Indian types may be united by budding or grafting.

Certain seedlings of the Victoria No. 9 mango produced fruit identical to that of the parent tree, a phenomenon believed due to the fact that seeds of the Victoria No. 9 are polyembryonic, a condition which is thought to result in one hybridized and several parthenogenic seeds, the latter producing plants with fruit nearly like that of the parent tree. An improved method of grafting seedling mangoes was developed wherein the percentage of success was increased approximately 46 per cent.

Breadfruit was successfully propagated by the division of surface roots into 5-in. sections. Of the bananas tested during the year, the Kona Maimaoli is deemed the best cooking variety both on account of the quality of the fruit and the size of the clusters.

Cowpeas were most satisfactory among several winter cover crops tested in the citrus orchards. The Isabella grape, a variety found well adapted to Hawaii, may be made to ripen its fruit during every month of the year.

[Horticultural investigations at the Missouri Station] (*Missouri Sta. Bul. 210 (1924), pp. 55–57*).—This, the usual summation (E. S. R., 48, p. 635) of activities during the fiscal year, is composed of brief progress notes.

In hardiness studies, by H. D. Hooker, jr., it was found that tender plants, though usually containing more water, lose their moisture content more rapidly and can be completely dried in less time than hardy plants, which are presumed to contain a larger proportion of their water in colloidal combination. As indicated in other studies by this author, fall applications of nitrate of soda favored blossom bud formation the following spring. For example, York Imperial apple trees fertilized in the fall bloomed the succeeding spring, while control trees failed to produce any flowers.

Chemical analyses of tomato plants fertilized with various materials showed an inverse relationship between the sulphur and phosphorus content of the tissues. As compared with apple tissue, tomatoes contained larger amounts of sulphur. Peach trees receiving nitrogen fertilizers before blossoming required extra work in the thinning of the fruits. In fertilizer studies with tomatoes, J. T. Quinn found that phosphorus is the primary limiting factor in production. Nitrogen affected early growth and the amount of early fruit.

Basket willow investigations, by T. J. Talbert and A. M. Burroughs, indicated that the American Green and Yellow Osier varieties are best adapted to Missouri conditions. Of several willow varieties, the Caspian appeared to be best suited to waste flood lands. A comparison of butts, middles, and tips of cuttings as propagating material showed no significant differences in favor of any portion.

Of four materials, pectin, saponin kerosene emulsion, commercial miscible oil, and homemade calcium caseinate, tested by H. G. Swartwout as spreaders in lime-sulphur sprays, the first two materials gave better control of apple scab.

[Horticultural investigations at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1923, pp. 6, 7, 8, 9, 10*).—Brief statements are presented on activities under various projects, continuing previous work (E. S. R., 49, p. 533).

For the early spinach crop, the King of Denmark and Savoy-leafed varieties were less productive than the Giant Thick-leaf, which, however, in the late crop was surpassed by the Savoy variety. Black Beauty, Extra Early Dwarf, and New York Improved eggplants bore larger fruits than did the Florida High Bush, Early Long Purple, and Black Pekin varieties. A comparison of Copenhagen market and Charleston Wakefield cabbages for spring planting showed the former variety to mature more and larger heads. A strain test of the Salamander or Black-seeded Tennis Ball lettuce showed wide variation in germination and productivity.

Studies of the effect of potassium and sodium on asparagus indicated that when used with moderate to heavy potassium applications chlorids are the better source of sodium, but when used with smaller amounts of potassium either the chlorids or the carbonates are useful sources of sodium when used in amounts up to 500 lbs. per acre of sodium oxid.

Yield records of carrots planted on 16 limed and fertilized plats which for the two preceding years had been planted to the same crops showed from 692 to 802 bu. after carrots, oats, alsike clover, and cabbage; from 823 to 877 bu. after rye, redtop, buckwheat, red clover, timothy, and potatoes; and from 889 to 999 bu. following squash, corn, mangels, millet, rutabagas, and onions. There was harvested an exceptionally large proportion of cull carrots from the buckwheat and potato plats. Based on 6-year averages, late cabbage yielded 9.51, 9.05, 8.9, and 8.11 tons per acre following, respectively, beets, spinach, potatoes, and peas as early season crops. In order to study the relation of one plant to another, carrots, corn, mangels, oats, onions, and potatoes were grown crosswise of certain plats in 1922 and lengthwise in 1923. The effect of the 1922 crop upon the 1923 crop was particularly noticeable on plats where acid conditions were manifest and where phosphorus was deficient. Onions yielded three times as much following corn as following mangels, and corn succeeding corn was more productive than corn succeeding mangels. Indications were obtained that there was more active aluminum in the areas of poorest growth.

Substitution crops for the greenhouse, R. Magruder (*Ohio Sta. Mo. Bul., 9 (1924), No. 3–4, pp. 63–72, figs. 3*).—An overproduction of leading greenhouse crops, tomatoes, lettuce, and cucumbers, led to a study of various possible substitute plants, data upon the culture, yields, and sales of which are herein presented in comparison with those for standard crops.

Relation between the composition of California cantaloupes and their commercial maturity, E. M. Chace, C. G. Church, and F. E. Denny (*U. S. Dept. Agr. Bul. 1250 (1924), pp. 27, figs. 2*).—Studies conducted in California by the Department in an effort to establish suitable tests by which the stage of development of cantaloups might be determined so as to avoid the harvesting and shipping of fruit too immature to ever attain satisfactory edibility showed certain physical and chemical changes in cantaloups associated with approaching maturity.

It was found that the soluble solids content, the refractive index, and the sucrose content of the juice increase and the percentage of starch in the seeds decreases as the melons ripen. The juice of melons which were mature when picked had a specific gravity of at least 1.04, equivalent to 10 per cent solids, a refractive index of at least 55 on the immersion refractometer, and a sucrose content of not less than 4.5 per cent. The seeds of such melons contained less than 0.5 per cent of starch. Melons gained in flavor but not in sweetness after harvesting. Changes occurring in melons held at low temperatures like that of refrigerated cars were so slight as to suggest that composition during and immediately following storage indicates their condition when picked. When held at ordinary temperatures there was observed a slight loss in sucrose after softening. Seeds of stored melons showed a slight loss in starch.

In concluding, it is suggested that it would be advisable for growers to delay picking until a few of the melons have become field ripe, for at this stage a much greater proportion of the field run will be commercially mature. The general lack of care in selecting properly matured melons was shown in an examination of 22 commercially packed crates, only 2 of which contained as high as 80 per cent of satisfactory fruit.

The chilling of tomatoes, H. C. Diehl (*U. S. Dept. Agr., Dept. Circ. 315 (1924), pp. 6*).—Working with Globe, Acme, and Stone tomatoes harvested when fully developed but still green in color, the author found that short periods, 1 to 4 days, at from 30 to 32° F. did not interfere with proper coloring and ripening subsequent to removal to warm environments. Longer exposures, on the other hand, prevented coloring and caused the fruits to decay without ripening. Similar results were secured with partially colored tomatoes.

Paper-wrapped Globe tomatoes packed in 6-basket carriers and placed in storage ranging from 30.5 to 32° kept 5 days without materially affecting color or flavor development subsequent to removal. Green and partially colored Globe tomatoes undercooled to respective minimums of 26.5 and 26.9° ripened upon removal to warm temperatures without any perceptible injury. In general conclusion the author suggests that the results of the investigation indicate that within certain time limits tomatoes may be exposed without injury to low temperatures, provided they are not actually frozen.

Planting the orchard with attention to details which lead to ultimate success, L. P. Lewis (*Ohio Sta. Mo. Bul., 9 (1924), No. 3-4, pp. 47-56, figs. 2*).—A general discussion in which are considered such items as the selection of site, time of planting, planting arrangements, intercropping, varieties, and the pruning of young trees.

[Horticultural investigations at the Moses Fell Annex, Indiana] (*Indiana Sta. Circ. 117 (1924), pp. 13, 14, fig. 1*).—Pruning studies with young apple trees showed that trees receiving little or no pruning were making much more growth than were severely pruned individuals. Trees growing in sod responded favorably to nitrate fertilizers, while those in clean cultivated and cover-cropped areas showed no benefit. Manure, chopped cornstalks, or chopped sod proved satisfactory mulches for trees set on steep uncultivated hillsides.

Comparative size of apple trees, J. H. Gourley (*Ohio Sta. Mo. Bul., 9 (1924), No. 3-4, pp. 44-46*).—In order to obtain accurate data on size differences between the trees of various well-known apple varieties, careful measurements were taken on trees of 47 varieties in a 31-year-old orchard (trees 33 ft. apart) located on a comparatively level area. Arbitrarily dividing the 47 varieties into five size groups, 5 were classified as very large, 13 as large, 10 as medium to large, 14 as medium, and 5 as small or dwarfish. The Rhode Island Greening variety was largest in respect to trunk and head diameters, the Golden Russet and Greenville had the tallest trees, and the Tetofsky was the smallest of all in respect to trunk, head, and height.

Spraying experiments in southeastern Ohio, F. H. Ballou and I. P. Lewis (*Ohio Sta. Mo. Bul., 9 (1924), No. 3-4, pp. 35-43*).—In continuing previously noted investigations (E. S. R., 49, p. 338), 27 spraying treatments were compared in 1923 in an old Rome Beauty orchard at Carpenter and 14 treatments in a San José scale, apple blotch, and apple scab infested Ben Davis orchard near Barlow. In general the results conformed with and further emphasized those of the preceding year.

At Carpenter the apples sprayed with the stronger Bordeaux mixtures were decidedly inferior in color to those sprayed with lime sulfur or weak Bordeaux mixtures. Unmistakable evidence was obtained that where Bordeaux mixture was used on apple varieties susceptible to copper injury such injury is caused not only by sprays applied after the petals have fallen but by sprays applied at the pink bud stage. In respect to scab control, lime sulfur used throughout the season gave somewhat better results than did strong Bordeaux mixture. Slight, if any, differences in fungus control were observed between sprays made from the usual commercial or the dry form of lime sulfur. Finely ground gypsum or calcium sulfate, when used at the strength of 4-50, proved of little value for scab and only of slight value for blotch control. Hydrated lime used alone was found much more effective than gypsum, its efficacy in scab control at 9-50 strength being approximately two-thirds that of 3-9-50 Bordeaux mixture or 1-40 lime sulfur. It is believed that lime sprays may be satisfactory and inexpensive substitutes for the usual summer schedule, especially when used on varieties not especially susceptible to scab.

In the Barlow experiments both Bordeaux mixture and lime sulfur gave excellent and nearly equal control of blotch. Even the trees sprayed with 0.75-2.25-50, the weakest strength used, gave 99.5 per cent control. The minimum amount of blotch-free fruit in the Bordeaux mixture plats was 99.1 per cent and in the lime sulfur plats 95.5 per cent. Lime sulfur was, however, superior to Bordeaux mixture in checking San José scale and in yielding a better colored and more attractive fruit.

Some spraying costs of labor and material, C. W. Ellenwood (*Ohio Sta. Mo. Bul., 9 (1924), No. 3-4, pp. 57-63, fig. 1*).—Records taken of the amount of material used and the cost of application in spraying investigations with trees of determined size in the station orchards at Wooster yielded information as to the cost of standard spraying programs in common use throughout the State.

Based on the prevailing prices of labor and materials in 1923, dormant lime sulphur sprays cost practically the same whether manufactured from dry or liquid materials. The addition of casein increased the cost of spraying Jonathan trees without showing material benefit, except that the arsenate of lead was apparently more evenly distributed. Substitution of hydrated lime for lime sulfur in the petal fall and succeeding sprays did not reduce russeting on Grimes below that of an adjacent row sprayed with the usual lime sulfur arsenate spray.

Of the total cost of spraying, approximately one-half was for labor and machinery. The costs of spraying in a variety orchard where the yield per tree averaged 12 bu. in 1923 were approximately the same whether lime sulfur was used throughout the season or Bordeaux used in four of the six applications. The spraying cost per bushel of fruit was less in the orchard comprised of four standard varieties having an average yield 10.5 bu. per tree and more in a young Stayman and Delicious orchard having an average yield 2.5 bu. per tree than in the variety orchard.

Blackberry growing, G. M. Darrow (*U. S. Dept. Agr., Farmers' Bul. 1399 (1924), pp. II+18, figs. 14*).—This publication, a revision of and superseding

Farmers' Bulletin 643 (E. S. R., 32, p. 639) by the same author, relates to the general cultural requirements of the blackberry, discussing such points as soils, varieties, propagation, fertilizers, training, harvesting, and the control of fungus and insect pests.

Coffee varieties in Porto Rico, T. B. McClelland (*Porto Rico Sta. Bul. 30* (*1924*), *pp. 27, pls. 11*).—As a result of extensive tests of long established and also recently introduced varieties of coffee, a plant which is of great importance in Porto Rico, occupying second place both in respect to acreage and in export value, the author presents detailed descriptions of the plants and berries of a large number of varieties representing three distinct groups, the Arabian, Liberian, and Robusta. Coffees of the Arabian group are by far the most important in Porto Rico, yielding a superior product low in caffein and highly esteemed in the world markets, especially those of Europe. No distinct varieties of Porto Rican coffee are recognized, but it is generally accepted that the coffee produced at higher altitudes is of superior quality. Three coffees, Columnaris, Maragogipe, and San Ramón, members of the Arabian group and introduced by the station, ripened their fruit considerably later than the ordinary Porto Rican coffee and may, therefore, be useful in extending the season. In general, beverage coffee prepared from introduced varieties of the Arabian group did not differ materially from that prepared from native coffee, indicating that the environment is the determining factor in relation to quality. The foliage of the Liberian coffees, on account of its leathery texture, was observed to be resistant to leaf miners, serious enemies to Arabian varieties in certain areas of Porto Rico. The Robusta coffees, generally conceded to be high producers, are not recommended on account of the inferior quality of the prepared beverage. Efforts to distinguish the three groups according to bean weight were unsatisfactory, there being found as much variation within as between the groups. In respect to size of cherries, the Liberian group is characterized by large, the Robusta by small, and the Arabian by medium sized fruits.

Inheritance of composition in fruit through vegetative propagation.—Bud variants of Eurèka and Lisbon lemons, E. M. Chace, C. G. Church, and F. E. Denny (*U. S. Dept. Agr. Bul. 1255* (*1924*), *pp. 19*).—With a view to associating physical differences already observed and recorded (E. S. R., 43, p. 440) with possible differences in composition, fruits of several distinct strains of Eureka and Lisbon lemons were studied in respect to specific gravity, percentage of rind, oil, pulp, and juice, and percentage of acid and of sugar. A statistical analysis of the results, presented largely in tabular form, showed the following probable differences: In the Lisbon variety, the fruit of the Dense Unproductive strain had a higher specific gravity than that of the Bull strain and was more acid than that of the Open strain. The Bull strain had the highest proportion of rind, and the Lisbon strain was more acid than either the Open or the Dense Unproductive strain. Few marked differences were observed in the Eureka lemon, practically the only significant variation being that the fruit of the Eureka strain showed a higher acidity than that of the Shade Tree strain.

The introduction is by A. D. Shamel.

Herbaceous perennials, F. L. Mulford (*U. S. Dept. Agr., Farmers' Bul. 1381* (*1924*), *pp. II+91, figs. 71*).—Beginning with a brief presentation of information on the nature of herbaceous perennials, their proper utilization, culture, and propagation, the author discusses various of the more common and valuable members of the group, pointing out their growth characteristics, soil requirements, and special uses, and indicates, with the aid of a map, in which sections of the United States each species may be expected to thrive. Tabulated data on the time of flowering, height of the plant, etc., and an index to the common and botanical names are included.

Marketable California decorative greens, C. L. Flint (*California Sta. Circ. 275 (1924), pp. 15, figs. 6*).—Several plants, the foliage or fruit of which are utilized for decorative purposes, are discussed in relation to their habitat, growth, characteristics, ornamental value, harvesting, shipping, marketing, and special uses. The author suggests that there exists an opportunity in California for growing this type of ornamental plants, especially in those sections far removed from the native habitat.

FORESTRY.

Purchase of land for National forests under the act of March 1, 1911, the Weeks law (*U. S. Dept. Agr., Dept. Circ. 313 (1924), pp. 15*).—A discussion of the purpose, provisions, and operation of the Weeks Law and amendments, the text of which is presented, together with a statement of unit areas in which purchases of land have been recommended and will be favorably considered.

Twenty years of silviculture at Mont Alto, G. S. Perry (*Forest Leaves, 19 (1924), No. 10, pp. 154–156*).—In the comparatively brief period that the State of Pennsylvania has owned the Mont Alto Forest there has been developed a forest nursery capable of producing approximately 4,000,000 trees annually. In addition silvicultural studies and experiences have shown that white and green ash and walnut are not adapted to any except the more fertile soils of southern Pennsylvania. European larch was found capable of rapid height growth but required reasonable fertility and adequate moisture, and because of its susceptibility to sawfly injury can not be grown except in mixed stands. Growth studies show that on sites of medium quality at Mont Alto oaks and associated hardwoods require approximately 90 years to attain an average diameter at breast height of 16 in., the average annual increment being approximately 40 cu. ft. per acre.

Estate forest policy, A. D. O. Le Sueur (*Jour. Bath and West and South. Counties Soc., 5. ser., 18 (1923–24), pp. 1–20*).—It is stated that in forest tree planting on private estates the shorter lived and more rapid growing species should be utilized. Oak and beech on account of their slow growth are not recommended, whereas poplar because of its extremely rapid growth and many uses and easy working of its wood is considered highly desirable. Ash, sweet chestnut, larch, and Douglas fir are deemed valuable. Silvicultural practices, such as planting, thinning, protection from enemies, etc., are discussed.

Forest resources of the Czechoslovak Republic: Fall of 1920 [trans. title] (*Příspěvky Statis. Lesů. Repub. Československ., (Contrib. Statis. Forest. Tchécoslov.), 1924, pp. 51–86, 90–98*).—Statistical data are presented on the extent of the forest areas, percentage of the total forests owned by the State or other organizations, proportion of coniferous and deciduous species, and the annual increment in the various types of forests.

Fourth annual report of the forestry commissioners [for the] year ending September 30th, 1923 (*[Gt. Brit.] Forestry Commrs. Ann. Rpt., 4 (1923), pp. 40, pls. 2*).—This, the usual annual report (E. S. R., 49, p. 537), contains brief summaries of activities during the year, together with data on expenditures, revenues, alterations in area, etc.

The total area planted or sown in the State forests during the year was 10,463 acres, 9,807 of which were conifers. In new plantations and replants there were used 17,800,000 trees, of which 37 per cent were Scots and Corsican pines, 27 per cent Norway and Sitka spruces, 17 per cent European and Japanese larches, and 12 per cent Douglas fir. The total area in nurseries at the close of the year was 441 acres, stocked with 133,000,000 seedlings and 43,000,000 transplants. Larch, Norway and Sitka spruce, Corsican and Scots pine, and Douglas fir seeds stored in air-tight glass carboys retained their viability in a satisfactory manner.

Administration report of the forest department of the Madras Presidency for the year ending 31st March, 1923, H. TIREMAN ET AL. (*Madras Forest Dept., Ann. Admin. Rpt., 1923, pp. 97+LXV+11*).—This report includes as usual the statement of the chief conservator of forests and of the conservators of the six forest circles and that of the principal of the forestry college at Coimbatore (E. S. R., 50, p. 545).

The rubber position and Government control, A. PHILLIPSON (*London: P. S. King & Son, Ltd., 1924, pp. 100, fig. 1*).—A statement concerning the overexpansion of the rubber planting industry in the East Indies and the effort on the part of the British Government to stimulate prices by curtailing production.

DISEASES OF PLANTS.

[Report of the department of] botany (*Missouri Sta. Bul. 210 (1924), pp. 41, 42*).—In experiments carried out by W. S. Robbins on the water absorption by potato tuber tissue in buffer mixtures, it was found that changes in the reaction of dilute buffer mixtures in contact with tuber tissue indicated that below pH 6 the solutions became more alkaline, and above pH 6 they remained unchanged or became more acid. From this it was concluded that potato tuber tissue responds in water absorption, in the absorption of dyes, and in the changes in reaction it produces in dilute buffer mixtures much like a protein with isoelectric point of pH 6.

Studies were also made of the absorption of basic and acid dyes of the mycelium of *Rhizopus nigricans*, and it was found to respond like a protein with the isoelectric point at about pH 5 to 5.2.

In additional studies made by W. J. Robbins, I. T. Scott, and B. B. Branstetter on varietal resistance of wheat to scab, a number of resistant or partly resistant varieties were obtained in addition to those previously reported (E. S. R., 48, p. 643).

Greenhouse experiments in which tomato plants were grown in pots of soil adjusted to varying H-ion concentration and inoculated with a single sport strain of *Fusarium lycopersici* showed that there were maxima points at which wilt occurred in ranges of pH 3.7 to about 6.4 and average pH 7.2 to 8.45, with a minimum of wilt occurring between pH 6.4 and 7.

Studies of corn root rot are said to have shown that field tests with diseased seed corn in comparison with disease-free seed, as determined by the modified rag doll germinator, showed no appreciable difference in the yields of the two lots of seed. Numerous tests made under sterile conditions are said to have shown that seed corn can be selected without the use of the rag doll germinator. Ears that are sound and solid, with bright white butts and clean tips and that show no molds or discolorations, are said to be, for all practical purposes, disease-free. Preliminary greenhouse experiments indicated that corn root and stalk rot symptoms may be produced on plants from disease-free seed planted in virgin soil which has been inoculated with the corn root rot fungi.

Abstract of mycologist's annual report, 1923 [Zanzibar Protectorate], E. J. WILSFORD (*Zanzibar Agr. Dept. Ann. Rpt. 1922, pp. 7, 8*).—Most of the numerous deaths of clove trees during recent years, formerly attributed to drought, bad culture, and unsuitable soil, were shown during 1922 to be caused by two diseases, a rapid root rot and a die-back, which are briefly discussed. The first is associated with a soil-dwelling saprophytic fungus attacking the roots under conditions indicated, the second to a wind-borne fungus gaining stomatal entrance to leaves roughened by the alga *Cephaleuros mycoidea*.

Wheat scab and corn rootrot caused by Gibberella saubinetii in relation to crop successions, B. Koehler, J. G. Dickson, and J. R. Holbert (*Jour. Agr. Research [U. S.], 27 (1924), No. 11, pp. 861–880, pls. 2, figs. 3*).—The results are given of surveys and field experiments on the relation of the preceding crop to the occurrence of wheat scab and corn root rot.

Wheat scab is said to be most severe where wheat follows corn in the rotation, and the yield of corn susceptible to root rot is reduced where corn follows badly scabbed wheat in the rotation. *G. saubinetii* was the principal organism isolated from scabbed wheat heads, and it was found abundant on old cornstalks. When applied to disease-susceptible corn this organism caused a considerable decrease in stand, general vigor, and yield. Resistant strains of corn, field selected, well cured, and also selected for vigor and freedom from disease, as shown by germination tests, were injured to a less extent by inoculation with the wheat scab organism. Such corn did not suffer much reduction in yield when grown after scabbed wheat.

The authors suggest a crop rotation in which the wheat crop neither directly precedes nor follows the corn crop.

A note on Fusarium wilt of gram in Burma and measures taken to combat it, A. McKerral (*Agr. Jour. India, 18 (1923), No. 6, pp. 608–613, pl. 1*).—Of the varieties of gram (*Cicer arietinum*) kept under observation at the Padu Agricultural Station in the Sagaing District (near the center of the principal gram tract), a black Burmese variety gave until about 1918 the best returns, owing principally to its resistance in connection with Fusarium wilt. This quality appeared to have become progressively lost by 1923, a variety known as Karachi introduced about 1918 showing more resistance and other desirable qualities.

In 1921 a yield test between these varieties was arranged both at Padu and at Mandalay. The Burmese variety was practically destroyed, the Karachi gram was practically uninjured, showing, moreover, fine growth, good yield, and no dead plants. Widespread and varied loss was caused by the wilt organism *Fusarium* sp.

Three points here emphasized are the extreme virulence of the causal Fusarium in certain localities, the local presence of gram types at least temporarily resistant, and the question as to how far any type is really immune or resistant to the wilt fungus, which is clearly allied to the Fusarium attacking *Cajanus indicus*.

Potato wilt and stem-end rot caused by Fusarium eumartii, R. W. Goss (*Nebraska Sta. Research Bul. 27 (1924), pp. 83, pls. 9, figs. 4*).—In a previous publication (E. S. R., 49, p. 147) the author showed that in Nebraska *F. oxysporum* attacked the potato only under favorable conditions and that infection experiments with that organism failed to produce the typical disease.

In the progress of further investigations a different species of Fusarium was isolated from stem-end rot tubers, and this proved to be a virulent parasite capable of producing wilt and stem-end rot of the potato. Cultural studies of the organism showed it to be *F. eumartii*, a species not previously reported from Nebraska. The disease caused by this organism was found widely distributed in the commercial potato sections of the State, and it is considered to be one of the most serious diseases in the older potato sections in western Nebraska. Isolation studies showed that the organism could usually be recovered from the roots of infected plants, and could be isolated from the lower stem unless the disease was far advanced and secondary invaders were present. The discolored portions in the upper stem were always sterile. The organism could also be recovered from stolons and infected tubers still attached to the plant, except from the most advanced portions of the discolored tissue. Infected tubers in storage were found to usually contain a large number of rapidly growing secondary parasites which overgrow the causal organism and make isolation difficult.

An examination of infected plants showed that the organism does not invade the xylem vessels to any great extent, and that wilt is not due to a blocking of these vessels by the growth of the organism. In the roots the organism was seldom found in the vascular cylinder. It reaches the stem from the root, chiefly through the cortex, and may eventually penetrate all the stem tissues. In the stolons the organism was chiefly found in the cortex, and in the tuber necrosis occurred chiefly in the vascular bundles, especially in the early stages of the disease.

The temperature and other growth relations of the organism were determined. It was found that seed infection resulted in a slow progress of the disease up the stem and sometimes out into the roots. On the other hand, soil infection resulted in a rapid progress of the disease through the roots, and after reaching the stem discoloration of the vascular system progressed downward into the healthy seed piece.

Field experiments showed that the amount of the disease resulting from inoculated seed could be correlated with environmental conditions as previously determined by greenhouse experiments. The disease was readily transmitted by stem-end rotted and internally discolored tubers. Infested soil was found to be one of the chief sources of inoculum.

The author claims that the disease can be controlled partially by the selection of healthy seed and the use of long rotations on infested soil, or by the use of new potato soil. The amount of stem-end rot in the tubers can be reduced by digging infected fields before tuber infection has occurred. The storage rot can be held in check by temperatures below 10° C. (50° F.).

Observations on sugar cane gummosis in Porto Rico [trans. title], J. Matz (*Rev. Azucarera y Agr.*, *1* (*1921*), *No. 9*, *pp. 252–255*).—Sugar cane gummosis appeared in Porto Rico first in 1920. The present account deals with its local and varietal incidence, its effects, and the likelihood of its connection with *Bacterium vascularum*.

Influence of temperature on the pectinase production of different species of Rhizopus, J. L. Weimer and L. L. Harter (*Amer. Jour. Bot.*, *10* (*1923*), *No. 3*, *pp. 127–132*).—The species of Rhizopus previously indicated (E. S. R., 48, p. 547) as decaying sweet potato are said to produce, in most cases at least, an enzym which dissolves out the middle lamellae so that the cells lose their coherence, the potatoes reducing to a soft watery mass, though the cells themselves are not penetrated, at least not in the early stages of decay. The nonparasitic species actually exceed some of the parasitic in enzym production.

The influence of temperature on pectinase production was studied in the case of *R. nigricans*, *R. reflexus*, *R. microsporus*, *R. delemar*, *R. oryzae*, *R. chinensis*, *R. nodosus*, *R. tritici*, and *R. maydis*. Apparently the enzym is produced at any temperature at which the fungi will grow. The amount of enzym produced was least at the highest temperature. The nonparasitic species (*R.*

microsporus and *R. chinensis*) produced considerable enzym, whereas *R. nigricans*, one of the parasitic species, gave a very small amount.

"A comparison was made of the relative length of time required by the enzym produced by the different species to macerate the tissue of freshly dug sweet potatoes and of those which had been held in storage for several months. The fungi were grown at three different temperatures, 40, 30, and 9° C., maceration being carried out at 40°. In general, it was found that the middle lamellae of old potatoes were dissolved in about one-half the time required to macerate the tissue of new ones."

Pectinase in the spores of Rhizopus, J. L. Weimer and L. L. Harter (*Amer. Jour. Bot., 10 (1923), No. 4, pp. 167–169*).—"The spores of *R. nigricans* and *R. tritici* both contain an enzym, pectinase, which is capable of dissolving the middle lamellae of raw sweet potatoes. The rate of maceration by the spores of *R. nigricans* is relatively much slower than that produced by the spores of *R. tritici* when the concentration of the spores by weight is the same."

The relation of the enzym pectinase to infection of sweet potatoes by Rhizopus, L. L. Harter and J. L. Weimer (*Amer. Jour. Bot., 10 (1923), No 5, pp. 245–258*).—The authors conclude that "Rhizopus can not infect sweet potatoes through the unbroken skin. Spores and hyphae smeared on a freshly cut surface will produce infection only rarely. However, when the fungus is given a saprophytic start by growing on dead rootlets, in synthetic agar solidified on the cut surface of the potato, or in dead cells killed by charring over a Bunsen burner, infection takes place readily. Furthermore, infection can be brought about readily by growing the organism for one or two days in sweet potato decoction, if the decoction and mycelium are poured into a 'well' made in the potato and then sealed over with a cover glass to prevent evaporation. Infection is accomplished only after the dissolution of the middle lamellae by means of an enzym (pectinase) secreted by the growing hyphae. In practically all cases infection takes place in wounds where there is some dead tissue upon which the fungus can get a saprophytic start. During the growth of the mycelium in these dead cells, the enzym is produced which, when it comes in contact with the living cells of the host, dissolves the middle lamellae; the cells then die, and a suitable substance for the further development of the fungus is provided.

"The practical significance of these results is that wounding is a preliminary necessity to infection. Although sweet potatoes are necessarily wounded at digging time when they are broken from the stem, other wounds made by rough handling during harvesting, storing, and preparing for the market should be avoided as much as possible."

The relation of temperature to the Fusarium wilt of the tomato, E. E. Clayton (*Amer. Jour. Bot., 10 (1923), No. 2, pp. 71–88, pls. 4, fig. 1*).—This work was carried on under greenhouse conditions in the Wisconsin soil-temperature tanks, primarily to study the effects of soil and air temperatures on the development of the tomato wilt disease due to *F. lycopersici*, and secondarily to study the influence thereon of other environmental conditions.

When the fungus was exposed in Petri dish cultures to temperatures ranging from 4 to 38° C., the growth optimum was found at about 28° (82.4° F.), although abundant growth was secured from 18 to 31°. The disease was practically inhibited at soil temperatures above 33° or below 21°. Air temperature proved as effective in controlling the appearance of the disease as was soil temperature. The temperature conditions of soil and air most favorable for the disease, as determined in tanks, was a soil temperature of about 27° and an air temperature, after the fungus has established itself in the stem, of about

28°, with short periods when the temperature suddenly rises to an excessively high point, 33°.

Evidence accumulated during these experiments leads to the view that wilting and death of plants attacked by the Fusarium wilt disease are due, not to mechanical plugging of the xylem bundles, but rather to toxic action.

The relation of soil moisture to the Fusarium wilt of the tomato, E. E. Clayton (*Amer. Jour. Bot., 10 (1923), No. 3, pp. 133–147, pls. 3*).—Tomato plants growing in soil of low moisture content (13 to 19 per cent) proved to be very resistant to *F. lycopersici*. The plants in saturated soil were immune to attack. In general, any moisture shortage sufficient to check vegetative vigor of host checked the disease proportionally.

When rapidly growing plants held at a temperature below 20° C. (68° F.) were brought into a temperature favoring the disease (25 to 30°) they were soon attacked by the wilt. However, if the soil was allowed to dry out at once the appearance of the wilt was very much delayed. Thus, rapidly growing succulent plants, which had been susceptible to the disease, were made disease-resistant by allowing the soil to become very dry.

"Plants growing in soil with a very low moisture content lost their disease resistance if a rapid, vegetative type of growth was induced by the addition of sufficient water to keep the soil moist. Plants growing in saturated soil were immune to attack, but if the moisture content was lowered the disease soon developed. The immunity of the saturated soil plants was apparently correlated with the practical absence of nitrates in the host tissues."

Hydrogen-ion concentration as related to the Fusarium wilt of tomato seedlings, E. C. Sherwood (*Amer. Jour. Bot., 10 (1923), No. 10, pp. 537–553, pl. 1*).—"Experiments were conducted with naturally acid silt loam and sandy loam soils, adjusted to various degrees of acidity and alkalinity by the use of calcium carbonate and calcium oxid, in order to determine the effect of soil reaction on the development of Fusarium wilt of tomato seedlings. The highest percentage of wilt always occurred in the most acid soil of the series. With very few exceptions, the percentage of wilt decreased quite uniformly as the H-ion concentration of the soils decreased, until approximately pH 7.4 was reached. The percentage of wilt which developed in soils having a more alkaline reaction than pH 7.4 was lower in one case and higher in the other, but the plants made a very poor growth in soils having a reaction more alkaline than pH 7.4. No sharp delimitation was apparent, neither could any limiting degree of acidity or alkalinity be found at which the disease would not develop.

"Culture experiments were carried out with *F. lycopersici* in nutrient solutions adjusted to H-ion concentrations ranging from pH 1.8 to 8.4. Spores of the organism exposed to the same temperatures as the growing tomato seedlings germinated in the solutions varying in H-ion concentrations from pH 2.2 to 8.4. No germinations occurred in the solutions adjusted to pH 1.8. Growth of the fungus in the solutions adjusted to pH 2.2 was very slight and caused no change in the reaction of the medium. The fungus grew well at all H-ion concentrations from pH 2.8 to 8.4. Growth at pH 2.8 in one case caused a slight change in the reaction of the medium toward greater alkalinity. At all H-ion concentrations from pH 3.6 to 8.4, the growth of the organism was accompanied by changes toward greater acidity."

Fusarium wilt of tomato and its control by means of resistant varieties, J. W. Lesley (*California Sta. Circ. 274 (1924), pp. 6, figs. 2*).—A popular description is given of the wilt of tomatoes due to *F. lycopersici*, which is said to inflict serious losses in tomato fields in California. For the prevention of the disease the author recommends the use in seed beds of soil free from the fungus, and in fields a rotation of crops. Where fields are known to be infected with the fungus, the growing of resistant varieties is suggested.

Treatment of apple canker disease, H. G. Swartwout (*Missouri Sta. Bul. 210 (1924), p. 57*).—The author claims that a mixture of white lead and linseed oil in which were dissolved bichlorid of mercury and mercuric cyanid was not effective in the control of Illinois or blister canker of apple trees. Cleaning and painting the cankered spots was of some value in checking the disease and prolonging the serviceable life of the trees.

The relation of low temperatures to root injury of the apple, R. F. Howard (*Nebraska Sta. Bul. 199 (1924), pp. 32, figs. 4*).—A study was made to determine the temperature at which apple stock roots were killed or injured, the relative hardiness of scion and stock roots, varietal differences in hardiness of scion roots, rate and extent of scion rooting, winter temperatures in orchard soils, and the rate of change as well as the absolute temperature of wet and dry soils in midwinter.

It was found that individual French crab and seedling apple stocks varied in their ability to withstand cold. Many were killed or severely injured when exposed to 14° F. for two hours in an air chamber. Scion roots of most varieties of apples appeared to be hardier than French crab and seedling roots of equal size, and small roots were more susceptible to cold than large, older ones. Considerable differences were noted in the tendency of varieties of apples to form roots from scion wood, some producing roots the first year in the nursery, while others had none at the end of the third year.

At a depth of 7.5 in. the temperature of the soil under blue grass sod was from 2 to 7° higher in midwinter than in a clean cultivated area. The moisture content of the soil was found not to influence greatly the minimum temperature reached in midwinter at several inches below the surface. Dry soil, however, responded to atmospheric changes more quickly than a wet one. If less injury occurred to roots in a wet soil than in a dry one, the author believes it was probably due to protection afforded by the moisture medium and not to the higher soil temperatures in the region of the roots.

Diseases of apples on the market, D. H. Rose (*U. S. Dept. Agr. Bul. 1253 (1924), pp. 24, figs. 8*).—An analysis is given of data secured from inspections made by the Bureau of Markets, U. S. D. A., as to diseases in the commercial apple crop in a number of portions of the United States. The inspections covered a period of four years, and it was found that as a whole blue-mold rot occurred more commonly than any other disease. In the box crop scald was second and decay, which includes a number of rots, third. In the barrel crop decay came second, followed by black rot. In all, 12 diseases were reported in the box crop, 18 in the barrel crop, with 9 diseases common to both.

The disease index in the barrel crop was one-third larger than that for the box crop, the difference being largely due to the greater variety of rots in the barrel crop. Summer and fall varieties are said to show less disease, on the average, than winter or long-storage varieties. The box crop showed a steady increase in percentage of disease from October till June, and the barrel crop only from December till June. The percentage of disease, particularly rots and scalds, seems to be largely a matter of length of the storage period, those stored longest being most seriously affected. In the barrel crop the percentage of disease was less in cars from New York, Michigan, Virginia, and West Virginia than in those from all other Eastern States taken as a whole. The percentage of disease in the box crop was slightly heavier in the cars from Idaho than in those from the other Western States considered as a whole.

Data from a relatively small number of cars are said to indicate that large apples are more susceptible than small ones to blue-mold rot, decay, scald, internal breakdown, and water core, and that apples in the fancy grade suffer more from scald than do those in the extra fancy grade.

Prune and cherry brown-rot investigations in the Pacific Northwest, C. BROOKS and D. F. FISHER (*U. S. Dept. Agr. Bul. 1252 (1924), pp. 22, pls. 5, figs. 14*).—The results are given of five years' investigation of brown rot of prunes and sweet cherries as it occurs in the lower Columbia and Willamette Valleys of Washington and Oregon. No evidence was found to indicate that the disease was carried over winter by twig cankers or mummies remaining on the tree. Apothecia were abundant in uncultivated prune orchards, arising in most cases from prunes that were partly buried or covered with only a few inches of soil. They were also found on Black Republican cherries, and this is believed to be the first instance reported of apothecia occurring on cherries.

Blossom infection occurred on both prunes and cherries, sometimes destroying a third to a half of young prunes and even a higher percentage of cherries. The application of sprays just before the blossoms opened and just after the petals had fallen decreased blossom infection. Lime sulphur was found to frequently cause severe spray injury on prunes, and Bordeaux mixture also sometimes caused injury. Both fungicides resulted in smaller sized sweet cherries. It was found necessary to add calcium caseinate or rosin fish-oil soap to the spray materials in order to secure satisfactory spreading and sticking on the fruit. Bordeaux mixture, lime sulphur, self-boiled lime sulphur, and sulphur dust were all used to control the disease, and all were found fairly efficient in holding it in check.

A spraying schedule is presented for the control of brown rot of prunes and sweet cherries in western Washington and Oregon. Holding and shipping tests showed that spraying improved the keeping quality of fruit even when the amount of disease in the orchard was practically negligible.

Occurrence of the currant cane blight fungus on other hosts, N. E. STEVENS and A. E. JENKINS (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 11, pp. 837–844, pls. 2, fig. 1*).—The authors report that the currant cane blight due to *Botryosphaeria ribis* is known to occur in Massachusetts, Connecticut, New York, Ohio, Pennsylvania, New Jersey, Maryland, and Virginia, and studies are presented showing that the fungus also occurs on at least two unrelated host species. A fungus identical morphologically and in cultural characters with the currant blight fungus was collected on the horse-chestnut and rose, and inoculation experiments on currants with the fungus from both these hosts produced typical cane blight.

In view of the agreement of the fungi from the different hosts in cultural characters, morphology, and parasitism, the conclusion seems warranted that they are identical.

Treatments in autumn against grape downy mildew [trans. title], A. GARCÍA Y LÓPEZ (*Bol. Agr. Téc. y Econ.* [*Spain*], *15* (*1923*), *No. 179, pp. 1034–1037*).—Treatment of the grape downy mildew in autumn includes a preparatory pruning away and burning of affected parts, followed by a Bordeaux spray of 8 per cent. In the spring, one month before budding occurs, the ordinary copper sprays at 5 per cent strength should be applied. Iron sulphate at 25 per cent is applied to combat anthracnose.

Internal decline of lemons.—I, Distribution and characteristics, E. T. BARTHOLOMEW, J. T. BARRETT, and H. S. FAWCETT (*Amer. Jour. Bot., 10* (*1923*), *No. 2, pp. 67–70, pl. 1*).—Internal decline of lemons has been present in California for 25 or 30 years and is still increasing, though fluctuating in severity. Hot inland valleys show considerable of the trouble, and Eureka and Lisbon, the principal varieties grown, reveal no marked differences in susceptibility. Trees aged 3 or 4 to 50 years may be affected. The tree-ripe fruit sometimes shows as large a proportion as 95 per cent affected. The symptoms are described.

Internal decline of lemons.—II, Growth rate, water content, and acidity of lemons at different stages of maturity, E. T. Bartholomew (*Amer. Jour. Bot., 10 (1923), No. 3, pp. 117–126*).—This study was undertaken to determine the possible bearing on the etiology of internal decline of lemons of the rate at which lemons increase in size, as influenced by climatic and seasonal changes and the time of year at which the fruits are set, and the increase in acidity and water content of the fruits at different stages in their development.

"While the lemon tree tends toward the production of new fruits continuously, the age of the tree and climatic and soil conditions make the production more or less seasonal. In the inland districts the seasonal setting of new fruits is more marked than in the coastal regions. The time of the year when set, the age of the tree, and climatic and soil conditions are all factors determining the growth rate of the fruits. Some fruits may mature in 7 or 8 months, while others growing on the same tree may require as much as 14 months in which to mature. Lemons may actually decrease in size while still attached to the tree, in consequence of the withdrawal of water from them by the leaves. This withdrawal of water from the fruits by the leaves may result in the collapse of at least a portion of the tissue in the stylar end of the fruit.

"The wilting coefficient of the soil as indicated by lemon leaves can not be considered a safe criterion as to whether or not the lemon fruits are suffering from a lack of water. There is practically no difference between the water contents of the two ends of the normal lemon. As the lemon enlarges, its water content increases, but this increase is much more rapid up to the time that it is about 3.8 cm. in diameter than from that time to maturity. The size of the lemon is not necessarily proportional to the percentage of water it contains. In September a lemon 1.9 cm. in diameter may have a much lower water content than a lemon 1.27 cm. in diameter in December. Mature lemons may show considerable variation in water content. The range in this series of experiments was from 88.2 to 92.14 per cent.

"While the total acid content of the lemon increases rapidly as it approaches maturity, the true acidity increases very little after the lemon has reached a diameter of about 3.8 cm. There are quite wide variations, but the average of a large number of stylar and stem ends of normal lemons shows the mean acidity to be substantially the same for each. Mature lemons of practically the same age and size have a comparatively wide range of acidity."

Chestnut black canker [trans. title], G. Lo Priore (*Bol. Agr. Téc. y Econ. [Spain], 15 (1923), No. 179, pp. 1038–1045*).—An outline is given of information and opinion of chestnut black canker, of the diseases supposed to be related thereto, and of the organisms claimed to be causal in this connection.

Pecan scab experiments in 1922, J. B. Demaree (*Amer. Nut Jour., 18 (1923), No. 1, pp. 4, 5*).—At Baconton, Ga., a plat receiving two applications of Bordeaux mixture and two of lime sulphur was as well protected from scab as was one receiving three applications of Bordeaux and one of lime sulphur, the checks being practically a failure. At Dewitt, Bordeaux mixture having three different strengths and two separate adhesives gave good results. Bordeaux mixture is deemed the most effective spray used as a preventive of pecan scab, but there is always the possibility of some foliage injury. Lime sulphur is advised for the later applications.

Resin added to fish-oil soap produced an undesirable gummy precipitate when added to Bordeaux mixture, clogging the valve of the spray pump.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The destruction of rabbits with calcium cyanide, M. Henry (*Agr. Gaz. N. S. Wales, 34 (1923), No. 7, pp. 485–488*).—The results obtained from the use of calcium cyanid in destroying rabbit pests in New South Wales are considered encouraging and to make further trials desirable. The advantages and disadvantages of this method of rabbit destruction are summarized.

Hymenolepis nana and H. fraterna, W. N. F. Woodland (*Nature [London], 113 (1924), No. 2845, p. 675*).—In feeding experiments with mice, the author finds that *H. nana* and *H. fraterna* are one and the same species, thus confirming the conclusion of Saeki and Uchimura.

The status of fish culture in our inland public waters, and the rôle of investigation in the maintenance of fish resources, W. C. Kendall (*Roosevelt Wild Life Bul. [Syracuse Univ.], 2 (1924), No. 3, pp. 204–351, figs. 26*).—This account, presented by the ichthyologist of the Roosevelt Wild Life Forest Experiment Station, at Syracuse, N. Y., includes references to the food of fish in inland waters, which includes insects.

The senses of insects, N. E. McIndoo (*Smithsn. Inst. Ann. Rpt., 1920, pp. 461–483, pl. 1, figs. 14*).—This is a contribution from the U. S. D. A. Bureau of Entomology.

Mullen rosettes as winter shelters for insects, W. L. McAtee (*Jour. Econ. Ent., 17 (1924), No. 3, pp. 414, 415*).—The author finds a common mullen, *Verbascum thapsus*, to furnish suitable shelter for hibernating insects and presents a list of those collected.

Temperature as a limiting factor in the life of subcortical insects, S. A. Graham (*Jour. Econ. Ent., 17 (1924), No. 3, pp. 377–383*).—The author finds that the distribution of insect species within a log depends to a very large degree upon the temperature in different parts of the log. The most heat-resistant groups, of which the genus Chrysobothris is representative, are found only in the warmer parts, whereas those species less resistant to heat are found only where extremely high temperatures do not occur. On the basis of temperature, it is possible to divide the insect inhabitants of a log into several ecological groups. A list of 24 references to the literature is included.

[Insects as controllers of the prickly pear pest in Australia], T. H. Johnston (*Australasian Assoc. Adv. Sci. Rpt., 16 (1923), pp. 371–381*).—An annotated list of insects which attack the prickly pear in Australia is here presented.

Hydrocyanic acid retained by fumigated cheese, P. Simmons (*Jour. Econ. Ent., 17 (1924), No. 3, pp. 416, 417*).—Experiments conducted by the author have led to the conclusion that until more extensive tests are made cyanid fumigation of cheese should not be recommended.

Entomology, L. Haseman et al. (*Missouri Sta. Bul. 210 (1924), pp. 48–51*).—Of the 31 species of mosquitoes recorded from Missouri, only 2 are malarial mosquitoes, namely, *Anopheles quadrimaculatus* and *A. punctipennis*.

A study of control measures for the chinch bug led to the determination that the most effective way to use calcium cyanid is to plow a deep furrow between the wheat and corn, throwing the dirt toward the corn, the calcium cyanid flakes being placed in the bottom of the furrow in the early afternoon at the rate of 1 lb. for every 60 ft. and renewed every day. Good results were obtained by dragging a log in the furrow, and this method when properly carried out is effective and considerably cheaper than calcium cyanid. A barrier of crude oil or creosote also proved effective. The calcium cyanid dust gave excellent results when applied to growing corn, badly infested with chinch bugs, by means of a knapsack duster at the rate of 15 lbs. per acre. When heavy infestations occur it is necessary to make two applications about three days apart to get effective control.

Studies of the annual life cycle of the Hessian fly in Missouri and means for its control are briefly referred to. In control work with injurious pests of melons and related crops, it was found that equal parts of calcium cyanid dust and air-slaked lime gave fairly good insect control and no injury to the plants. Naphthalene balls, at the rate of 1, 2, and 3 balls per hill, pressed lightly into the soil beneath the plants did not injure them, and in no case was there injury to the plants by the striped cucumber beetle or by any other insect. The naphthalene balls lasted and seemed to be effective for a period of about six weeks.

In control work with the bollworm on corn, none of the applications of arsenate of lead as a spray or a dust gave sufficient control to warrant their use on a large scale. A great variation is said to have been noted in the length of time required for the codling moth to complete its life cycle, resulting in the overlapping of generations, making control of the later brood more difficult.

The results obtained from the application to peach trees of standard lime-sulphur sprays and lubricating oil emulsion against the San José scale in the nursery are reported upon in tabular form. None of the lime-sulphur solutions gave a satisfactory kill. A 1 per cent oil emulsion did not give satisfactory kill, but a 2 per cent solution in general gave just as good results as 4 and 10 per cent solutions. The effect of various sprays on the control of the apple grain aphid and the results obtained from the use of paradichlorobenzene against the peach borer are reported upon in tabular form.

The present status of information relative to the oriental peach [moth] and other matters of insect control, T. J. Headlee (*N. J. State Hort. Soc.* [*Proc.*], *1923, pp. 56–70*).—The insects considered include the codling moth, Japanese beetle, gipsy moth, wood leopard moth, San José scale, and oriental peach moth.

It is pointed out that codling moths were unusually abundant in some sections in 1923 and were able to infest practically 100 per cent of all the fruit borne by certain unsprayed trees and 75 per cent of the crop in some treated orchards. Notwithstanding various explanations made by growers for this condition, it is stated by the author that the pest is being controlled in the very districts where some of the worst damage has occurred, and that the insect if properly treated year by year is susceptible to satisfactory control even under such conditions of excessive abundance.

The enormous increase in spray burn on both peaches and apples, mainly in the southern half of New Jersey, is believed to be connected with the practice of increasingly heavy spray applications incident to the displacement of the spray rod by the spray gun. It appears to the author that the spray gun, by reason of the increased force under which the liquids are delivered, effects a closer contact between the spray materials and the surface of the fruit and foliage, and leaves a larger residue of spray upon them. It is thought that, except under extremely hot weather conditions, and possibly even then, the burning is due primarily to the decomposition of the arsenate of lead and the consequent formation of water-soluble arsenites. In north Jersey the reduced injury is thought to be due to lower temperatures, since decomposition of the arsenate of lead occurs presumably more rapidly in higher temperatures.

The author points out that, aside from early peaches, the injury from the Japanese beetle can be handled quite satisfactorily with spraying mixtures. The leopard moth has during the past three years been appearing in considerable numbers in many apple orchards.

The oriental peach moth was found in the peach districts first at Middletown, since which time it has made its appearance throughout practically all the peach-producing districts in the State (E. S. R., 51, p. 161). There are three full broods and sometimes a partial fourth in New Jersey, as against four broods and a partial fifth in Maryland and Virginia. Reference is made to the condition in New Jersey in connection with the accounts by Stearns, previously noted (E. S. R., 51, p. 457). A supplemental account of observations of its biology by A. Peterson is included.

[Report of the] entomological branch (*Canada Min. Agr. Rpt., 1923, pp. 86–94*).—The occurrence of and work with the more important insects of the year in Canada are briefly reported under the headings of field crop and garden insects, forest insects, foreign pests suppression, etc.

The western wheat-stem sawfly is said to be increasing its area of distribution. At the present time it covers half the wheat-growing area of he Province of Manitoba, while its distribution in Saskatchewan is very wide and there has been a material increase in Alberta. It has been found that the cutting of wheat stems by the larvae of this insect is accomplished when the stems are mature and is not dependent upon the stage of maturity of the larvae. The European corn borer is reported to have spread to 45 townships in Ontario.

An active spruce budworm outbreak in the Temiskaming district of Quebec and in eastern Ontario has decreased in severity during the season, but the injured balsam is dying very rapidly, more than 50 per cent of the balsam over the whole 5,000 square miles of forest included in the outbreak being already dead or dying. An outbreak of forest tent caterpillars took place, in which poplar shade trees and shelter belts were defoliated in the southern part of the prairie provinces. The apple sucker now infests 3,750 square miles in Nova Scotia, an increase of 33 per cent over the preceding year. A fungus parasite of the apple sucker, namely *Entomophthora sphaerosperma*, has been successfully spread artificially.

[Economic insects in France] (*Min. Agr. [France], Ann. Épiphyties, 9 (1923), No. 2, pp. 73–120, figs. 4*).—Papers relating to insects of economic importance are as follows: The Acridians in France in 1921 and 1922, by P. Vayssière (pp. 73–83); Some Problems in the Biology of Grasshoppers, by B. P. Uvarov, which has been translated from English by L. Chopard (pp. 84–108); and Observations on the Species of Baris and Their Parasites, by J. C. Faure (pp. 109–120).

In his studies of the curculionids of the genus Baris, which attack herbaceous plants, particularly Cruciferae, in France, Faure records observations of the following parasites: *Bracon variator* Nees, *B. baridii* Marsh, *B. glaphyrus* Marsh, *Entedon pharnus* Wlk., *Eurytoma curculionum* Mayr., and *Pteromalus* sp.

[Economic insects in France] (*Rev. Zool. Agr. et Appl., 23 (1924), Nos. 1, pp. 1–15, figs. 17; 2, pp. 29–53, figs. 7; 3, pp. 57–73, figs. 7*).—Papers here presented include the following: The Enemies of Grasshoppers in France, by

P. Grassé (pp. 1–15, 45–53, 57–65), and The Hoplocampa Fruit Worms in the Southwest of France (pp. 29–44) and The Natural Enemies of the Eudemis and of the Cochylis (pp. 66–73), both by J. Feytaud.

[Papers on economic insects] (*In Congrès de Pathologie Végétale, Strasbourg, 1923. [Paris]: Min. Hyg., Assist. [etc.], 1923, pp. 44–53*).—Papers presented at Strassburg in June, 1923, include A Study of the Invasion of the Italian Crickets [*Caloptenus italicus*] in the Seine and Marne in 1921–1922 (pp. 44, 45) and Observations of the Oviposition of *Habrobracon johanseni* (Vier.), A Braconid Parasite of the Potato-tuber Worm (pp. 46–48), both by B. Trouvelot; *Cladosporium lauri*, a Parasite of the Bay Tree Scale, *Aonidia lauri* (Bouché), by L. Raybaud (pp. 48, 49); Observations upon a Mycosis of Scale Insects, by J. Cotte (p. 50); and The Manner of Feeding of *Pachyneuron* sp., a Chalcid Parasite of the Pupa of *Syrphus halteatus* Deg., by J. C. Faure (pp. 51–53).

[Report of the] entomological section (*Egypt Min. Agr., Cotton Research Bd. Ann. Rpt., 3 (1922), pp. 59–66*).—The report deals briefly with bollworm attack in green bolls, estimation of loss by pink bollworm, survival of the pink bollworm during the winter, treatment of cottonseed against pink bollworm, the cottonseed bug (*Oxycarenus hyalinipennis* Costa.), and arsenic dusting, much of the data being presented in tabular form.

List of publications on Indian entomology, 1922, compiled by [T. B. Fletcher] (*Agr. Research Inst., Pusa, Bul. 147 (1923), pp. 42*).—This is a compilation of the publications on Indian entomology published in 1922 (E. S. R., 49, p. 849).

A new Sericothrips (Thysanoptera) injurious to cotton, J. D. Hood (*Canad. Ent., 56 (1924), No. 6, pp. 149, 150*).—Under the name *S. gracilipes*, a new species of thrips collected by A. Busck, of the U. S. D. A. Bureau of Entomology, in Tlahualilo, Coahuila, Mexico, in October, 1917, is described. This species, in association with somewhat larger numbers of *Heliothrips phaseoli* Hood, is reported by Busck to have rendered several thousands of acres of cotton worthless.

Greenhouse thrips in Sweden [trans. title], O. Ahlberg (*Meddel. Centralanst. Försöksv. Jordbruksomrädet [Sweden], No. 233 (1922), pp. 14, figs. 19*).—Three species of thrips which occur in the greenhouse in Sweden, here considered, are *Parthenothrips dracaenae* Heeg., the greenhouse thrips, and *Heliothrips femoralis* Reut. The first two occur with equal frequency, while *H. femoralis* is less often met with.

On the anatomy and bionomics of the red cotton bug, Dysdercus cingulatus (Fabr.), H. Singh (*Asiatic Soc. Bengal, Jour. and Proc., n. ser., 19 (1923), No. 1, pp. 15–42, pls. 9*).—This report of the author's studies includes a list of 30 references to the literature cited.

Control of the pink boll-worm on cotton, C. M. Taylor (*Nature [London], 113 (1924), No. 2847, pp. 745, 746*).—The appearance of the pink bollworm on cotton in Queensland leads the author to discuss control measures.

Second notes on the oriental peach moth, Laspeyresia molesta Busck [trans. title], C. Harukawa (*Ber. Ōhara Inst. Landw. Forsch., 2 (1923), No. 3, pp. 235–258, fig. 1*).—This paper presents the results of investigations conducted by the author in continuation of those previously noted (E. S. R., 41, p. 459). *L. molesta* has been found to be widely distributed among the prefectures of Japan where the peach or the pear is grown, although there are many localities in which it has not yet been discovered. In most of the prefectures of the mainland of Japan it produces four or five generations each year, the larvae of the last generation hibernating. The larvae injure the young shoots and the fruit of the sand pear, pear, peach, apple, and apricot, and also the shoots of the Japanese flowering cherry, cherry, plum, Japan apricot, and the sand cherry.

While the time of emergence of the adults in the spring varies with the climatic conditions, it generally occurs between the middle of April and the middle of May. The larvae generally injure the shoots of the peach, cherry, Japanese flowering cherry, etc., in the spring and early summer, and from about the middle of July most of them attack the fruit of the sand pear. In the peach orchard the adult oviposits chiefly on the leaf of the peach, while in the pear orchard it lays its eggs mostly on the ripe fruit. While the pear is young and hard the adults prefer the peach tree on which to oviposit, but when the pear is ripe they seem to be attracted by the fruit, and a large part of the adults which appear in the peach orchards then migrate to neighboring pear orchards.

Odors attractive to ovipositing mosquitoes (Dipt.: Culicidae), S. E. CRUMB (*Ent. News, 35 (1924), No. 7, pp. 242, 243*).—This is a preliminary contribution from the U. S. D. A. Bureau of Entomology.

Notes on the pear midge (Contarinia pyrivora), L. P. WEHRLE (*Jour. Econ. Ent., 17 (1924), No. 3, pp. 411-414*).—This is a report of biological observations by the author in Connecticut during the summer of 1922, which includes tabular data on the time of pupation.

Fruit fly investigation, H. JARVIS (*Queensland Agr. Jour., 21 (1924), No. 5, pp. 382-385*).—The author reports upon the prevalence of *Chaetodacus tryoni* and records the appearance of a new fruit fly species quite distinct from *C. tryoni*, which appears to be distributed throughout the Granite Belt District. Notes on the woolly apple aphid, codling moth, bollworm on tomato, and several scale insects are included.

The fauna of France.—Anthomyidae, E. SÉGUY (*Faune de France.—Diptères Anthomyides. Paris: Paul Lechevalier, 1923, pp. XI+393, figs. 813*).—This contribution deals with the dipterous family Anthomyidae. A bibliography of eight pages is included.

A new genus and species of two-winged flies of the family Chloropidae injuring Manihot in Brazil, J. M. ALDRICH (*U. S. Natl. Mus. Proc., 65 (1924), Art. 21, pp. 2*).—The genus Teleocoma is erected for *T. crassipes*, a new species said to be a serious miner of cassava in Brazil.

Researches on the biology of dipterous parasites [trans. title], W. R. THOMPSON (*Bul. Biol. France et Belg., 57 (1923), No. 2, pp. 174-237*).—The first part of this paper (pp. 175-200), which treats of the problem of natural selection in dipterous parasites of insects, deals with elimination before oviposition, elimination at the time of deposition, accidents between the time of deposition and penetration of the body of the host, elimination at the time of penetration of the host, elimination in the body of the host, and elimination after the death of the host. The second part of the paper (pp. 201-237) deals with specific adaptation in entomophagous parasites.

Soil insecticide investigations at the Japanese beetle laboratory during 1923, B. R. LEACH, W. E. FLEMING, and J. P. JOHNSON (*Jour. Econ. Ent., 17 (1924), No. 3, pp. 361-365*).—Experimental work conducted by the U. S. D. A. Bureau of Entomology with a view to the discovery of methods for chemically treating the soil about the roots of plants for control of the soil stages of the Japanese beetle show emulsions of carbon disulphid and wormseed oil to be satisfactory, and these are now being employed by local nursery and greenhouse concerns.

The "turnip-fly" and its associates.—"Fly" proved to be the grass-grub beetle, D. MILLER (*New Zeal. Jour. Agr., 28 (1924), No. 4, pp. 239–247, figs. 16*).—This is an account of injury to turnip caused by the grass-grub beetle (*Odontria zealandica* White), locally known as the turnip-fly.

Banana weevil borer (Cosmopilites sordidus Chev.), J. L. FROGGATT (*Queensland Agr. Jour., 21 (1924), No. 5, pp. 369–378, figs. 2*).—This is the sixth progress report of studies of this pest by the author (E. S. R., 51, p. 554).

Cotton boll weevil control in Texas, A. B. CONNER and H. J. REINHARD (*Texas Sta. Circ. 32 (1924), pp. 3–14*).—This is a summary of information on control measures, particularly as applied to Texas conditions, with an introduction by B. Youngblood.

Notes on the nesting habits of several North American bumblebees, O. E. PLATH (*Psyche, 29 (1922), No. 5–6, pp. 189–202*).—The author presents a brief résumé of all that is known of the nesting habits of nine species of bumblebees. A list is included of 30 references to the literature cited.

General information for beekeepers, J. C. GOODWIN (*Fla. Plant Bd. Quart. Bul., 8 (1924), No. 3, pp. 77–88*).—This is a summary of information largely on diseases and enemies of bees and control measures.

Foulbrood: Recognition and treatment [trans. title], C. VAILLANCOURT (*Min. Agr. Prov. Québec Bul. 85 (1924), pp. 16, figs. 5*).—This is a summary of information on foulbrood of bees in Quebec.

American honey plants, together with those which are of special value to the beekeeper as sources of pollen, F. C. PELLETT (*Hamilton, Ill.: Amer. Bee Jour., 1923, 2. ed., rev. and enl., pp. 392, figs. 195*).—This is a revised and enlarged edition of the work previously noted (E. S. R., 43, p. 259).

Vespa arctica Rohwer, a parasite of Vespa diabolica De Saussure, W. M. WHEELER and L. H. TAYLOR (*Psyche, 28 (1921), No. 5–6, pp. 135–144, pls. 2*).—This is a report of observations by the authors made in New England in the summer of 1921.

Revision of the North American wasps of the subfamily Platygasterinae, R. M. FOUTS (*U. S. Natl. Mus. Proc., 63 (1924), Art. 15^{a}, pp. 145, pl. 1, figs. 10*).—This is a synopsis of a group of the hymenopterous superfamily Serphoidea.

Pear leaf blister mite (Eriophyes pyri Pag.), R. W. E. TUCKER (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 3, pp. 316–328, figs. 10*).—The author reports the discovery that the loss in crops in some parts of the western Cape Province due to the dying and flaring open of dormant fruit buds and the falling of blossoms and newly set fruit is due to *E. pyri*, not previously known to occur in South Africa. The average loss of crop due to mite injury in a badly infested orchard is said to be at least 25 per cent.

The control of acarine disease, J. RENNIE (*Bee World, 6 (1924), No. 1, pp. 7–9, 11*).—This is a review of control measures for this disease, presented as an address by the president of the Apis Club of Great Britain, in 1924.

FOODS—HUMAN NUTRITION.

Manual of human nutrition, A. J. J. VANDEVELDE (*Manuel de l'Alimentation Humaine. Brussels: J. de Lannoy, 1923, pp. 274, figs. 32*).—This is one of a series of manuals forming what is to be known as the library of the farm girl, covering subjects of particular interest and value in the management of the farm home.

The Food Research Institute, Stanford University, 1923–24 (*Stanford University, Calif., 1924, pp. 8*).—This is the annual progress report (E. S. R., 49, p. 660).

A study of the factors affecting the texture of cakes (*Missouri Sta. Bul. 210 (1924), pp. 57, 58*).—A brief report is given of a study by L. Stanley and M. M. Kennedy of the effect upon the texture of cakes of the various ingredients, the baking temperature, and the manipulation or method of combining the ingredients.

Sugar, by raising the temperature of coagulation of the batter and thus allowing the gases to escape, prevented the formation of tunnels and made the texture finer. Too little liquid tended to make the texture coarse and too much caused excessive steam formation. Cakes made from pastry flour were coarser and had a larger specific volume than those made from bread flour. Fat, if uniformly distributed, decreased the specific volume and made the texture finer. Baking powder affected the texture not only as a leavening agent but by increasing the porosity of the crust and the size of the cells.

Too low a temperature made the cakes coarse and, if an excess of baking powder was used, caused them to fall. Too high a temperature caused the cakes to peak and crack open. Cakes containing a high proportion of flour or of egg required a low temperature for baking. The optimum temperature for butter cakes was found to be between 175 and 195° C.

In combining the various ingredients better results were obtained by adding the fat to the flour and sugar or to the sugar alone than by using melted fat, the latter tending to toughen the cake and form tunnels.

Mineral constituents of Hawaiian vegetables, J. C. Ripperton (*Hawaii Sta. Rpt. 1922, pp. 16, 17*).—Determinations are reported of the principal ash constituents of fresh Hawaiian spinach and cabbage and the data compared with analyses of the same vegetables grown on the mainland. The locally grown samples compared favorably in percentage of the various ash constituents.

Canned tomatoes and tomato products (*Natl. Canners Assoc. Bul. 97-A (1924), pp. 15, figs. 7*).—This bulletin discusses briefly the extent of the tomato canning industry, the essentials of the canning process, and the nutritive value of tomato products. Several recipes are given for the use of canned tomatoes in soups, vegetable dishes, and salads.

Canned foods in relation to health, W. G. Savage (*Cambridge: Univ. Press, 1923, pp. VII+146, figs. 7*).—This volume, which comprises the Milroy lectures of 1923 delivered before the Royal College of Physicians, London, is in a sense a sequel to an earlier volume on food poisoning and food infection (E. S. R., 43, p. 261).

The first lecture deals principally with the canning industry as it exists at the present time in the United States and Great Britain and with the supervision exercised over canned food. In the second lecture, on the bacteriology of canned foods with references to spoilage, some of the data presented in previous reports (E. S. R., 51, p. 261) are discussed. In the third and final lecture on the relationship to disease conditions, the possible menace to health from canned foods is classified as bacterial, parasitic, chemical, and loss of accessory food factors. Under the first heading considerable attention is called to botulism, and a table is included of the outbreaks of botulism from canned foods in the United States and Canada from 1906 to 1922, the data including the locality, number of cases and deaths, and the material involved, with the nature of the canning process (home or commercially canned). A table is also included of food poisoning outbreaks from causes other than botulism in Great Britain from 1882 to 1923. A brief discussion is included of the present status of knowledge concerning the effect of canning on the vitamin value of foods.

Reports to the food investigation board of the principles involved in the processing of canned foods and on laboratory methods for the examination of canned foods are given as appendixes.

The nature of corrosion in canned fruits, E. F. Kohman and N. H. Sanborn (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 290–295, figs. 4*).—In this extension of an investigation previously noted (E. S. R., 49, p. 856) a more detailed study was made of the action of oxygen in causing perforations in enameled cans.

The earlier experiment of canning apples with varying amounts of oxygen was repeated, and at the same time other cans, after being packed with apples, were filled with nitrogen or carbon dioxid instead of oxygen. Other cans were filled with so-called soaked apples, apples prepared by peeling, quartering, and holding under 2 per cent salt solution for from 16 to 18 hours at ordinary temperature. The various lots were canned in the same manner, with a 2-minute exhaust in boiling water, and a 5-minute process, and were examined from time to time for the extent of perforation, swells, and springs.

The cans containing oxygen had practically all perforated before there was any evidence of deterioration in the other cans. Analyses of the gas in similar lots of canned apples prepared in the same way showed a gradual disappearance of oxygen accompanied by increase in hydrogen in the oxygen-filled cans.

Apples canned in the same way but in plain instead of enameled cans were analyzed after 38 weeks for tin and iron. The soaked and nitrogen-filled apples had the lowest amounts, the untreated next, and the oxygen-filled the highest amounts of both tin and iron.

In discussing the significance of these results, an effective means of preventing loss from oxygen is shown to be the use of an exhaust which would enable the respiratory process in the fruit to continue for as long a time as possible. If the temperature is allowed to rise too rapidly the enzym reactions are destroyed before sufficient oxygen has been eliminated. "There are no data available to show at what temperature the respiratory processes in fruit are destroyed. It undoubtedly varies with conditions and variety of fruit. Moreover, variable factors are always at play, control of which is difficult and often impossible. Different sets of conditions may give what on the surface appear to be contradictory results. It is of the utmost importance that these conditions be clearly understood."

Growth of Bacillus botulinus in canned meat [trans. title], **C. Bidault** (*Compt. Rend. Soc. Biol.* [*Paris*], *90 (1924), No. 14, pp. 1002, 1003*).—The author uses commercially canned meat as a culture medium for the growth of *B. botulinus*. A hole large enough to admit a pipette is punched in the can and after the inoculation this is sealed with solder, thus obtaining anaerobic conditions for the growth of the organism. It is stated that a comparison of the analysis of the material before and after the growth of the organism has shown no appreciable difference in ammoniacal nitrogen, but an increase in amino nitrogen to two or three times the amount in the original material and a complete disappearance of reducing substances. The reaction of the medium is no longer alkaline.

Practice in mayonnaise manufacture, S. K. Robinson (*Amer. Food Jour., 19 (1924), No. 4, pp. 185–187*).—These suggestions on mayonnaise manufacture, while designed for the wholesale manufacture of mayonnaise, are for the most part equally applicable to the home preparation and keeping of mayonnaise.

A preliminary survey of the effects of ultraviolet light on normal rabbits, J. H. B. Grant and F. L. Gates (*Soc. Expt. Biol. and Med. Proc., 21 (1924), No. 5, pp. 230–232*).—Five groups of 8 normal rabbits each, with ears shaved and backs clipped, were exposed to the unfiltered radiations of a quartz mercury arc lamp for 30 minutes daily at a distance of 1 meter. At the end of 3 weeks and once a week thereafter the rabbits in one series were etherized, bled from the aorta, and weighed (without the gastrointestinal contents). The various organs were weighed and the weights recorded in milligrams per kilogram net body weight. The changes in weight are reported as the percentage change from the corresponding figures for from 15 to 36 normal control rabbits examined at the same time of the year.

The changes in the parathyroids are the only ones discussed in the present communication. These were +34.6, +51.1, +31.9, +27.7, and +14.1 per cent at the end of 3, 4, 5, 6, and 7 weeks. Blood calcium determinations were made on the groups after the fourth week, the figures being 12.7, 12.9, and 12.6 mg. per 100 cc. of serum as compared with an average of 11.9 mg. for 60 normal control rabbits. The hypertrophy of the parathyroids and increase in the calcium content of the serum resulting from ultraviolet light radiation were confirmed in a second experiment in which a group of rabbits was given increasing exposures of ultraviolet light daily over a period of 4 weeks. This resulted in a relative increase of 32 per cent in the weight of the parathyroid over the normal figures and an increase in the calcium of the blood from 11.9 mg. per 100 cc. before exposure to 13.5 mg. on the twenty-second day and 12.9 mg. at autopsy.

"These preliminary experiments have served to relate the effect of ultraviolet light on calcium metabolism to the parathyroid glands. Whether the light acts primarily on the absorption and excretion of calcium and causes a rise in the blood calcium which results in an hypertrophy of the parathyroid glands, or primarily affects the glands themselves, remains to be determined."

The substitution of taurine for cystine in the diet of mice, M. L. MITCHELL (*Aust. Jour. Expt. Biol. and Med. Sci., 1 (1924), No. 1, pp. 5–9, figs. 3*).—Feeding experiments conducted on mice are reported, the results of which show that taurin can replace cystin in the diet in so far as making the diet adequate for growth is concerned. It is pointed out that this does not indicate necessarily that taurin is convertible into cystin in the animal body.

Feeding experiments on rats with plants at different stages of development, II, B. HARROW and F. KRASNOW (*Soc. Expt. Biol. and Med. Proc., 21 (1924), No. 5, pp. 232–234*).—A continuation of the investigation previously noted (E. S. R., 50, p. 769)) is reported briefly. Of 10 groups of rats, 1 was fed a normal diet and the others the basal diet of the previous study with vitamins A (cod liver oils) and B (yeast) alone and together and each with ungerminated, germinated, and green corn, respectively. During the first month each group of rats (4 to a cage) received 4 gm. of the germinated, ungerminated, or green corn, and during the second month this was increased to 8 gm. and the third month to 12 gm. At the end of the first month the group showing the most notable increase in weight, with the exception of the group on the regular diet, was the one receiving the basal diet, plus vitamin B, plus the green corn. This is considered to suggest an increase in the quantity of vitamin A in the corn. The groups receiving the diet containing vitamin A and one form of corn but no vitamin B showed greater gains from the sixth week on than the groups receiving vitamin B and one form of corn but no vitamin A. This is thought to indicate that the corn in the ungerminated, germinated, and green condition was rich in vitamin B.

The sensitization of the organism to deficient diets [trans. title], G. MOURIQUAND, P. MICHEL, and BERNHEIM (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 13, pp. 1098, 1099*).—To determine whether animals which have recovered clinically and anatomically (macroscopically) from deficiency diseases are immunized or sensitised to a second deficiency of the same type, a series of guinea pigs was kept for 24 days on a vitamin C-deficient diet, at which time all showed typical scorbutic lesions. They were then kept on a complete diet for from 10 to 20 days or until complete recovery had taken place, after which they were again placed on the deficient diet. At the same time control guinea pigs which had been maintained on a complete diet were also given the scorbutic diet. Among the latter animals the first signs of scurvy did not appear until about the fifteenth day, while in the others, previously cured of scurvy, the symptoms appeared in from 2 to 5 days. The survival period of these animals was also much shorter than of those suffering from scurvy for the first time. The cause of the increased sensitivity to the effects of the scorbutic diet is thought to be the persistence in the bone marrow of a fibrillar condition which was the only abnormal appearance of the bony tissue of the animals recovered from scurvy.

The platelet count in rats suffering from vitamin-A deficiency, S. P. Bedson and S. S. Zilva (*Brit. Jour. Expt. Path., 4 (1923), No. 6, pp. 305–310*).—This is essentially a reply to the criticism of Cramer, Drew, and Mottram (E. S. R., 50, p. 565) of the conclusions drawn in a previous communication (E. S. R., 49, p. 562). On the basis of further work, the authors reaffirm that they "are unable to confirm the original observation of Cramer, Drew, and Mottram that vitamin A deficiency in the rat is productive of a severe thrombopenia."

Acid-fast bacteria as a source of vitamin-B, S. R. Damon (*Jour. Path. and Bact., 27 (1924), No. 2, pp. 163–169, figs. 6*).—The experiments on the use of *Bacillus timothy* 213 as a source of vitamin B for the growth of rats (E. S. R., 50, p. 664) have been repeated with cultures of the organism grown on a medium every constitutent of which had been proved to be free from vitamin B. This medium consisted of beef extract 0.3, Difco peptone 0.5, sodium chlorid 0.1, and glycerin 4.5 gm. made up to 100 cc. with water. The organism grown on this medium and subsequently dried at 37° C. proved incapable of promoting growth in rats when fed at a 2.5 per cent level in a diet lacking only in vitamin B, but when fed at a 7.5 level promoted approximately normal growth. Similar results were obtained with *B. smegmatis* 246 and *B. moelleri* 627. These results are thought to indicate that a growth-stimulating substance analogous to vitamin B is synthesized by at least three members of the group of acid-fast bacteria.

Presence of toxic and insulin-like substances in oranges, grapefruit, and lemons, N. F. Fisher and E. B. McKinley (*Soc. Expt. Biol. and Med. Proc., 21 (1924), No. 5, pp. 248, 249*).—The authors report the separation from the juice, pulp, and rind of oranges, grapefruit, and lemons of a substance consisting of a toxic fraction which increases the blood sugar and a substance similar to insulin which causes a fall in the blood sugar. The latter substance acts simillary to insulin, there being no delayed action, as has been described by Collip for glucokinin (E. S. R., 50, p. 108).

The influence of insulin on the formation of glycogen, B. P. Babkin (*Brit. Jour. Expt. Path., 4 (1923), No. 6, pp. 310–317, figs. 2*).—A study is reported of the effect of insulin upon the glycogen content of the liver and skeletal muscle of normal rabbits and of rabbits in a state of hyperglycemia induced by subcutaneous or intravenous injection of glucose.

The glycogen content of the liver and muscle of rabbits fed on carrots, sugar, and oats was much lower after the injection of insulin than that of rabbits fed in the same way without insulin. In the rabbits which received the glucose and insulin simultaneously there was no pronounced accumulation of glycogen in the liver and muscles. It is concluded that insulin does not stimulate the formation of glycogen in normal animals.

The effect of insulin on the respiratory exchange of normal animals, B. R. Dickson, G. S. Eadie, J. J. R. Macleod, and F. R. Pember (*Quart. Jour. Expt. Physiol, 14 (1924), No. 1–2, pp. 123–149 figs. 7*).—A study of the respiratory exchange in normal dogs and rabbits following insulin injections with and without subsequent administration of glucose is reported, with the following results:

In dogs the injection of insulin was followed by a marked increase in the respiratory volume, commencing after the blood sugar had reached its lowest level; a corresponding increase in oxygen consumption; a decided increase in the respiratory quotient, which in different animals varied somewhat in its onset; and an acceleration of the pulse and respiration, commencing after the respiratory volume and oxygen intake had begun to rise.

In rabbits there was no increase in the respiratory volume, only a doubtful increase in oxygen consumption, and an increase in the respiratory quotient in three out of four observations. This occurred very soon after the injection of the insulin (from 15 to 45 minutes) and fell to about or below the normal level before the onset of convulsions.

In discussing these results, three possible causes for the increase in the respiratory quotient are suggested (1) "A greater relative increase in the metabolism of carbohydrates which might raise it to unity, (2) a reduction of carbohydrate to fat-like substances, and (3) a 'washing out' of CO_2, due either to the development of acid substances causing hyperpnoea, or to hyperpnoea due to other causes." Data reported on the carbon dioxid content of the blood plasma of several dogs, following insulin injections, indicate that the total CO_2-combining power and the total amount of CO_2 in the blood are not significantly lowered as the result of insulin. This is thought to rule out the third suggested cause of the increase in the respiratory quotient, and to point to the first as being the most plausible.

The action of insulin on the respiratory metabolism [trans. title], E. Gabbe (*Klin. Wchnschr., 3 (1924), No. 15, pp. 612, 613*).—The injection into rats of suitable amounts of insulin was followed by a prompt increase in the respiratory quotient. This persisted for a short time and then returned to a normal level. In discussing the mechanism of the action, the possibility is suggested that insulin has two effects, (1) an increase in the oxidation of the carbohydrates of the tissues and (2) the prevention of the change from glycogen into sugar. There is thought to be no evidence of a transformation of carbohydrate into fat in normal animals by means of insulin.

Behaviour of depancreatized dogs kept alive with insulin, F. N. Allan, D. J. Bowie, J. J. R. Macleod, and W. L. Robinson (*Brit. Jour. Expt. Path., 5 (1924), No. 2, pp. 75–83, pls. 2*).—Evidence is reported that in depancreatized dogs which have been treated daily for from 2 to 7 months with large doses of insulin death eventually occurs as a result of a breakdown of the hepatic function, accompanied by severe fatty infiltration of the liver. These results, together with the absence of such changes in cases of diabetes treated with insulin over long periods, are thought to suggest the possibility that the pancreas plays some part in fat metabolism.

On the blood phosphate after insulin convulsions, L. B. Winter and W. Smith (*Jour. Physiol., 58 (1924), No. 4–5, pp. 327–333*).—A further study is reported of the possible relationship between blood sugar and inorganic phosphorus as determined by the ratio of the two following insulin injection (E. S. R., 51, p. 271). In the present case determinations of inorganic phosphorus and blood sugar were made following the recovery of rabbits from insulin convulsions by means of glucose, adrenalin, adrenalin and thyroid extract together, and pituitary extract.

After adrenalin the inorganic phosphate in most cases regained the normal level quickly, but fell again. After pituitrin the effect was variable, and after glucose the normal value was not regained for a considerable period. Since the behavior of the inorganic phosphate differed, while the blood sugar returned to normal in all cases, "it may be evidence against the conversion of glycogen to a sugar-phosphoric acid complex as a result of insulin convulsions."

A simple method of prescribing diabetic diets, G. Baehr, H. Lande, and L. G. Graves (*Jour. Amer. Med. Assoc., 82 (1924), No. 19, pp. 1509, 1510*).—To simplify for general practitioners the dietary treatment of diabetes, a table has been devised which is essentially that of Joslin modified to give a proper antiketogenic balance. The table includes 12 test diets arranged in increasing order of carbohydrates, constant amount of protein, decreasing amounts of fat, and calorie values increasing from 1,300 to 1,500. The carbohydrate foods are placed in one group and the protein and fat foods in another.

The diets are designed to be used during the preliminary period of adjustment of the diet to maintain normal blood sugar. Following a preliminary fasting period the diets are given in increasing order until symptoms of glycosuria appear. Following another 24-hour fasting period, the patient is placed on the permanent maintenance diet, which is the diet two numbers above the one on which the glycosuria first reappeared, modified by increasing the protein allowance by one-half and the fat allowance by one-fourth.

The treatment of diabetes mellitus, E. P. Joslin (*Philadelphia: Lea & Febiger, 1923, 3. ed., rev. and enl., pp. XIII+17-784, figs. 31*).—Of particular interest in the third revision of this well-known volume are the sections on insulin; physiology and pathology (which includes a discussion of total metabolism in diabetes); the diet in health and in diabetes; treatment (including dietary control); foods and their composition; and height-weight scales, equivalents, and tables for computing metabolism. Included in the section on foods are tables prepared by E. M. Bailey of the Connecticut State Experiment Station on the composition of normal foods and of so-called diabetic foods (E. S. R., 47, p. 559), three standard hospital diets for diabetes, and diabetic menus for a week, with accompanying recipes.

The aetiology of rickets: An experimental investigation, II, D. N. Paton and A. Watson (*Brit. Jour. Expt. Path., 4 (1923), No. 4, pp. 177-195, pls. 2, figs. 6*).—This continuation of the investigation previously noted (E. S. R., 46, p. 360) deals with several questions concerning the etiology of rickets.

The first point investigated was the relative importance of restriction of the intake of calcium and of vitamin A on the production of rickets-like changes in the skeleton, and the retention of calcium and phosphorus on a calcium-rich and a calcium-poor diet. As judged by the reported feeding experiments with young pups, a limitation of the supply of calcium was of greater importance in determining the onset of rickets than was the limitation of vitamin A. A restricted supply of calcium, although inducing changes in the bones resembling those in rickets, did not change materially the calcium content of the blood and muscles and the phosphorus content of the blood. The latter appeared to be determined by the content of calcium. Within the limits of the amount of calcium used, from 0.02 to 0.198 gm. CaO per kilogram, the amount of calcium retained did not vary noticeably with the amount in the food.

Absence of direct sunlight was found to favor the onset of rickets. The addition of olive oil to a nonrickets-producing diet tended to change it to rickets-producing, while cod liver oil proved active in the cure of rickets.

The possibility of rickets having an infective origin is thought to be disproved by the failure to induce rickets in pups by feeding feces from cases of infantile rickets or by injecting blood from similar cases.

The thyroid gland in experimental rickets, I. MURRAY (*Brit. Jour. Expt. Path., 4 (1923), No. 6, pp. 335–339, pl. 1*).—The author has examined the thyroids of 43 pups used in the investigation of Paton and Watson noted above, classifying the condition found as normal, acute or complete hyperplasia, and chronic or colloid hyperplasia.

The cases classed as true rickets were associated with acute hyperplasia of the thyroids, while those classed as rickets from calcium starvation showed only chronic hyperplasia. In the normal animals and in those with healed rickets the thyroids were normal in appearance.

It is also reported that cod liver oil has a marked influence on the colloid content of the thyroid vesicles, as demonstrated by feeding experiments conducted on rats. Butterfat was found to be without effect.

ANIMAL PRODUCTION.

The native and cultivated forage crops of Argentina, F. REICHERT, R. A. TRELLES, ET AL. (*Las Plantas Forrajeras Indigenas y Cultivadas de la República Argentina. Buenos Aires: Univ. Buenos Aires, Facult. Agron. y Vet., 1923, pp. [236], pls. 119*).—The characteristics and distribution of the forage plants in Argentina are discussed, and the composition, digestibility, and feeding value of each are tabulated and diagramed. Illustrations of many of the plants are also given.

Succulents of the Karroo, G. A. GILL (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 2, pp. 256–260, figs. 3*).—Among the available succulent feeds of the Karroo are the spekboom (*Portulacaria afra*), several species of Euphorbia, several species of Atriplex (saltbushes), the prickly pear (Opuntia), and the American aloe (*Agave americana*).

The influence of asparagin and ammonium nitrate on the nitrogen metabolism of ruminants [trans. title], M. STARZEWSKA (*Rocz. Nauk Rolnicz., 10 (1923), No. 3, pp. 527–544*).—In this work, carried on at the Jagellonian University at Krakow with a sheep, the French abstract states that the addition of asparagin or ammonium nitrate to rations poor in protein has had a favorable influence on the nitrogen metabolism. That portion of the asparagin and ammonium nitrate not retained by the animal was eliminated in the urine as urea. The parallel action of the two products indicates that they are probably changed to the same or similar compounds, which are probably some form of ammonia.

The feeding of mineral supplements to livestock, H. H. MITCHELL (*Illinois Sta. Circ. 281 (1924), pp. 4*).—The mineral requirements of livestock and the most available sources of minerals are briefly discussed.

Vitamins in livestock feeding, H. H. MITCHELL and M. H. KEITH (*Illinois Sta. Circ. 282 (1924), pp. 20, figs. 5; abs., pp. 4*).—This is a popular presentation of the importance of vitamins for livestock and poultry, with particular reference to the sources through which they may be obtained.

[Experiments with beef cattle at the Missouri Station] (*Missouri Sta. Bul. 210 (1924), pp. 36, 37, 38*).—The results of two experiments continued from previous years (E. S. R., 48, p. 663) are briefly reported.

Limited grain rations for fattening cattle of different ages, E. A. Trowbridge and H. D. Fox.—In this experiment 2 lots each of calves, yearlings, and 2-year-olds were selected, the 1 lot of each age being fed for 143 days on a ration of shelled corn and linseed oil cake (6:1), with corn silage and alfalfa hay ad libitum, while the other lot of each age was fed alfalfa hay and corn silage ad libitum and as much linseed oil cake as usually eaten by the full-fed cattle for a 120-day period, after which they were finished in 72 days on corn and linseed oil cake, with blue grass pasture. Among the full-fed steers, the best gains were made by the 2-year-olds and slightly less by calves and yearlings. Younger cattle required less grain per unit of gain, but there was very little difference in the roughage requirements. Among the groups on limited rations, the 2-year-olds again made the best gains, while the calves exceeded the yearlings by 0.13 lb. daily per steer. The feed requirements per 100 lbs. of gain also increased with the age of the cattle. In comparing the length of the feeding periods, it is stated that the groups of yearlings and 2-year-olds that were full-fed made greater gains in 143 days than the other yearlings and 2-year-olds made in 192 days. There were 8 head in each lot.

Factors influencing the normal rate of growth in domestic animals and the permanency of the effects of arrested development, A. G. Hogan.—This includes the present information on the steers on the three planes of nutrition and the presentation of the formula for determining the surface area of cattle, previously noted (E. S. R., 50, p. 268).

Effect of winter rations on pasture gains of 2-year-old steers, E. W. Sheets and R. H. Tuckwiller (*U. S. Dept. Agr. Bul. 1251 (1924), pp. 24, figs. 23*).—This is a more detailed report of the investigation previously noted (E. S. R., 49, p. 867). More information is given on the cost of the rations, and coefficients of correlation have been calculated between the gains made at the different seasons and the total gains.

The sheep industry, D. A. Spencer, M. C. Hall, C. D. Marsh, J. S. Cotton, C. E. Gibbons, O. C. Stine, O. E. Baker, V. N. Valgren, R. D. Jennings, G. K. Holmes, W. B. Bell, and W. C. Barnes (*U. S. Dept. Agr. Yearbook 1923, pp. 229–310, figs. 62*).—This is a rather popular description of the world's sheep industry, with special reference to the methods of sheep husbandry in the different parts of the United States and the economic conditions prevailing in the sheep industry. The various phases of wool and mutton production are touched upon, with a discussion of the outlook for each.

The farm flock in New Hampshire, E. G. Ritzman (*N. H. Agr., 37 (1921–1922), pp. 26, figs. 5*).—A discussion of recommended methods and present practices of sheep raising in New Hampshire is given.

Sheep and wool, A. G. Michaelian (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 2, pp. 221–229, figs. 6*).—A description of sheep farming in South Africa.

The Angora goat industry in South Africa, P. D. Rose (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 2, pp. 230–237, figs. 4*).—A description of Angora goat farming and mohair production in South Africa.

[Experiments with swine at the Missouri Station] (*Missouri Sta. Bul. 210 (1924), pp. 34–36, 37, figs. 4*).—The results of the swine experiments are briefly given, many being continued from the previous report (E. S. R., 48, p. 664).

Age as a factor in animal breeding, F. B. Mumford and P. M. Bernard.—A continuation of this project, in which the females were bred at the earliest possible date since 1909, has shown no evidence of injury to the race or breed. The thirteenth generation of early mating farrowed at 10 months 12 days of age. A ninth generation female reached 687 lbs. at 4 years 9 months 12 days of age, and she farrowed 17 pigs in her seventh litter.

Age as a factor in animal breeding; the effect of plane of nutrition upon immature brood sows, F. B. Mumford and P. M. Bernard.—The weights, feed consumption, and numbers and average weights of pigs raised by 2 sows receiving low, 2 medium, and 2 high planes of nutrition are tabulated, with other information. The sows on the high plane of nutrition were heavier at 3 years 6 months of age and raised 29 and 25 pigs, respectively, averaging 2.25 and 2.08 lbs. Those on the medium plane of nutrition were decidedly lighter in weight, but raised 39 and 35 pigs, respectively, weighing an average of 1.77 and 2.33 lbs. at birth. The sows on the low plane of nutrition were distinctly the lightest of the three groups and raised only 10 and 19 pigs averaging 1.87 and 2.22 lbs., respectively, at birth.

Rations for pigs at weaning time, L. A. Weaver.—A comparison of various rations for weaning pigs on rape pasture has resulted in much the same conclusions as in previous years. Supplements of tankage with or without shorts and bran have proved uniformly satisfactory, but corn alone or when supplemented with garbage tankage gave poor results. Dried buttermilk was only slightly inferior to tankage.

Hogging down corn and soybeans, L. A. Weaver.—The average results from the four years of this experiment indicated that corn hogged down with a supplement of tankage produced the most rapid and economical gains, and that soy beans grown with the corn would not take the place of the tankage.

Feeding spring pigs for market, C. M. Vestal (*Indiana Sta. Bul. 279* (*1924*), *pp. 15, figs. 5*).—This is an account of seven experiments conducted over a period of 4 years, in which lots of early spring pigs fed heavily with pasture for the early fall market were compared with similar lots fed on limited rations with a greater range of pasture and finished for the later fall or early winter market. The rations of the pigs fed for the early market consisted of shelled corn and tankage fed in separate self-feeders, with 0.5 acre of pasture per 10 pigs. The limited fed lot received a ration of shelled corn 95 parts and tankage 5 parts, which was hand-fed in limited amounts with about 1.5 acres of pasture per 10 pigs. These pigs were later finished in dry lot on self-feeders with corn and tankage. The following table summarizes the results of the different experiments:

Full-feeding v. limited feeding of early spring pigs.

Trial.	Kind of pasture.	Average initial weight.	Average daily gain.		Extra time required by limited feeding.	Feed required for 100 pounds gain.			
			Full fed lot.	Limited fed lot.		Full fed lot.		Limited fed lot.	
						Corn.	Tankage.	Corn.	Tankage.
		Pounds.	*Pounds.*	*Pounds.*	*Days.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1	Clover	74	1.80	1.27	35	322.6	21.2	314.4	13.3
2	Rape	74	1.74	1.21	35	334.6	23.8	313.6	17.3
3	Clover	62	1.82	1.27	37	336.0	29.8	320.8	17.5
4	Alfalfa	62	1.90	1.29	39	327.6	24.8	317.4	17.3
5	Clover	68	1.53	1.12	33	336.1	30.6	325.0	18.4
6	Alfalfa	68	1.62	1.15	36	335.0	26.6	314.0	19.8
7	do	76	1.77	1.19	43	324.6	20.5	306.3	16.8

The full-fed hogs required more corn and tankage but less pasture than those fed limited rations, while the selling price was also considerably higher and the time required for feeding less. The author concludes that circumstances have sufficient influence to determine the more economical system advisable for individual feeders.

Forage crops for hogs and feeding hogs on forage crops, F. E. Boyd and G. E. Riddell (*Ala. Polytech. Inst. Ext. Circ. 70* (*1924*), *pp. 16, fig. 1*).—The first part of this circular, written by the senior author, deals with the different crops adaptable to hog raising, with methods of planting and cultivating each. In the second part of the circular, written by the junior author, the recommended methods of feeding hogs on forage crops are discussed.

Tankage beats alfalfa as corn supplement, W. J. Loeffel (*Swine World, 11* (*1924*), *No. 11, p. 7*).—In a feeding experiment at the Nebraska Experiment Station to compare tankage and alfalfa as supplements to corn, 256 pigs averaging 96 lbs. in weight were divided into lots of 10 to 16 each. The rations were fed in separate compartments of self-feeders in dry lot. The average gains of the 10 comparative lots were 1.56 lbs. per day on corn and tankage and 1.09 lbs. on corn and alfalfa. In making the former gains 392 lbs. of corn and 46 lbs. of tankage were required per 100 lbs., whereas in the latter gains 472 lbs. of corn and 70 lbs. of alfalfa hay were required. The advantage both in rate of gain and economy of gain is thus shown for the tankage.

Minerals for fattening pigs, W. D. Salmon (*Breeder's Gaz., 85* (*1924*), *No. 26, p. 765*).—The results of an experiment at the Alabama Experiment Station in comparing four mineral mixtures as supplements to a ration of 5 parts of corn and 1 part of hull-free peanut meal for pigs are reported. The mineral mixtures consisted of charcoal, marble dust, and salt equal parts; marble dust 2 parts and acid phosphate and salt 1 part each; marble dust 2 parts and steamed bone meal and salt 1 part each; and marble dust 5 parts, and steamed bone meal and salt 2 parts each plus 1 part of tankage. The four mineral mixtures proved to be of approximately equal value, making an average of 60.7 per cent better gains and requiring 8.2 per cent less feed per unit of gain than with the control lot receiving no minerals.

In the previous year two lots of pigs receiving the mineral mixture supplement of charcoal, marble dust, and salt made 65.1 per cent greater gains and required 19.5 per cent less feed per pound of gain than two other lots receiving no minerals. The basal ration consisted of corn 2 parts and peanut meal (hulls included) 1 part.

The self-feeder as a labor saver, H. E. Dvorachek and H. A. Sandhouse (*Arkansas Sta. Bul. 191* (*1924*), *pp. 3–10, figs. 2*).—The results are given of four trials in comparing the gains made and the economy of fattening pigs by self-feeding and hand-feeding. A summary of these results is given in the table below. The feeds used in each experiment consisted of corn chop, gray shorts, and tankage fed in separate self-feeders to the self-fed lots and hand-fed mixed as a thick slop for comparison.

Self-feeding v. hand-feeding for pigs.

Trial.		Number of pigs per lot.	Initial weight.	Self-fed lots.			Hand-fed lots.		
Number.	Length.			Average daily gains.	Feed consumed per 100 pounds gain.	Labor cost per 100 pounds gain.	Average daily gains.	Feed consumed per 100 pounds gain.	Labor cost per 100 pounds gain.
	Days.		*Pounds.*	*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	
1	56	10	140	1.92	353	$0.30	1.57	391	$1.02
2	56	6	110	1.50	434	.63	1.47	413	1.77
3	42	10	135	1.61	409	.31	1.64	423	.84
4	53	10	100	1.35	406	.43	1.15	410	1.40

The authors conclude that there is little difference in the rate of gain or in the costs of feed required in the two methods of feeding, but self-feeding required less labor.

Pig farming in South Africa, W. A. K. Morkel (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 2, pp. 250–255, figs. 3*).—A description of the methods of pork production in Souh Africa.

[Horse feeding experiments at the Missouri Station] (*Missouri Sta. Bul. 210 (1924), pp. 38–40, figs. 5*).—The results of experiments in growing draft colts and feeding brood mares are noted.

Growing draft colts, E. A. Trowbridge and D. W. Chittenden.—In continuing this experiment, 4 fillies made average daily gains per head of 0.64 lb. during their second summer on blue grass pasture when receiving average daily rations of 1.28 lbs. of soy bean hay and 0.32 lb. of mixed hay. During their second winter they made average daily losses of 0.58 lb. on average rations of 5.59 lbs. of soy beans, 5.15 lbs. of mixed hay, and 1.91 lbs. of silage. One filly, which proved to be not in foal, was broken and given a grain ration toward the end of the period.

Corn silage as a part ration for horses of various ages, E. A. Trowbridge and D. W. Chittenden.—An average daily ration of 16.82 lbs. of corn silage and 7.97 lbs. of hay proved satisfactory for wintering pregnant mares. The mares maintained their weight, and the colts produced were all strong and normal.

The calcium and phosphorus balances of horses on normal rations [trans. title], A. Scheunert, A. Schattke, and M. Weise (*Biochem. Ztschr., 139 (1923), No. 1–3, pp. 1–9*).—In conjunction with a study at the Physiological Institute at Dresden of a disease called ostitis fibrosa in horses receiving rations low in minerals, the daily calcium and phosphorus balances of two normal horses have been determined.

One horse received a daily ration of 5 kg. of oats, 0.6 kg. of chopped straw, and 2.25 kg. of hay, containing a total of 25.46 gm. of CaO and 53.16 gm. of P_2O_5. An additional average of 0.67 gm. of CaO was consumed in the drinking water daily. After a preliminary feeding period, the daily balances were determined during a 13-day test period as follows: +2 gm. of CaO and +11.4 gm. of P_2O_5. It was observed that over 99 per cent of the phosphorus secreted was in the feces, the amount in the urine being less than 0.5 gm. per day with the exception of 1 day.

The daily ration fed to the second horse consisted of 4 kg. of oats and 2 kg. of hay which was rather low in calcium, phosphorus, and protein. This ration supplied 16.08 gm. of CaO and 36.49 gm. of P_2O_5, while 0.26 gm. of CaO was supplied by the drinking water per day. The average daily balances determined were +0.35 gm. of CaO and —0.01 gm. of P_2O_5. During the first 3 days the calcium in the urine was very low, while the phosphorus was extremely high, being 2, 1.78, and 3.47 gm. After this time the phosphorus in the urine dropped to levels similar to those of the other horse.

The influence of a ration of oats alone on the calcium and phosphorus balances of horses [trans. title], A. Scheunert, A. Schattke, and M. Weise (*Biochem. Ztschr., 139 (1923), No. 1–3, pp. 10–16*).—In continuing the above studies, the daily calcium and phosphorus balances were determined during a 10-day period for a horse receiving a daily ration of 5.5 kg. of oats only. This ration had been fed for 9 days preceding the test. It was observed that the urine appeared very clear and had an acid reaction in contrast to the more cloudy urine with an alkaline reaction of normal horses. The calcium elimination in the urine was much reduced, the daily average being 2.7 gm., whereas the phosphorus elimination in the urine was greatly increased to an average of 13.16 gm. per day, while with the normal rations in the previous experiment it seldom exceeded 0.5 gm. daily. The average daily balances of the horse on this oat ration was −8.39 gm. of CaO and +1.05 gm. of P_2O_5. After being on this feed a little over 2 weeks the horse became lame and sore, which increased until hay was supplied.

A second horse was continued after 7 days' feeding on a ration of oats, hay, and straw for 5 days, during which time calcium and phosphorus balances were determined, as well as for a succeeding experimental period of 9 days when the hay was eliminated from the ration, and for 3 days when no feed was given. The urine was alkaline or neutral when the oats, hay, and straw were being fed, but changed to acid during most of the second period, and back to alkaline in the fasting period. The analyses showed that the calcium and phosphorus in the urine and feces were normal during the first feeding period, but with the removal of the hay the calcium eliminated in both the urine and feces droppd tremendously within 2 days, and the P_2O_5 eliminated in the urine increased from 10 to 20 times the normal amount as an average for the last 7 days. There were +69.6 gm. of P_2O_5 and −36.5 gm. of CaO retained during the 9-day period.

These experiments thus show how in a horse receiving a ration rich in phosphorus but poor in calcium the kidneys will eliminate larger amounts of phosphorus in the urine, which tends to offset the calcium deficiency.

The early history of the thoroughbred horse in South Africa, H. A. WYNDHAM (*London: Oxford Univ. Press; New York: Oxford Univ. Press, Amer. Branch, 1924, pp. XII+275, pls. 7*).—The early introduction, breeding, and raising of thoroughbred horses in South Africa are historically reviewed.

[Poultry experiments at the Missouri Station], H. L. KEMPSTER and E. W. HENDERSON (*Missouri Sta. Bul. 210 (1924), pp. 59–61*).—The poultry experiments were mainly continuations of those previously noted in the previous annual report (E. S. R., 48, p. 666).

Value of sour milk, beef scrap, cottonseed meal, gluten meal, and oil meal in rations for egg production.—In this experiment the following average numbers of eggs were produced with the different supplements to the basal ration: Twenty per cent tankage 132 eggs, 20 per cent meat scrap 151, 35 per cent dried buttermilk 129, 15 per cent tankage 163, 15 per cent tankage and 5 per cent cottonseed meal 128, 10 per cent tankage and 10 per cent cottonseed meal 147, 10 per cent tankage 125, 5 per cent tankage and 15 per cent cottonseed meal 126, 5 per cent tankage 130, and sour milk 130 eggs.

Age as a factor in poultry breeding.—The average weights of the progeny of hens and pullets were found to be practically indentical, and the egg productions were very similar. There were 17 per cent of the hens' eggs infertile, but only 6.28 per cent of the pullets' eggs were infertile. The hatching percentage of the fertile hens' eggs was 54.4 and of the pullets' eggs 50 per cent.

Time of moult as an index to productivity of hens.—A tabulation of the month of molting and the total and winter egg production shows that the production in both periods for the years preceding and following the summer during which the molting records were kept increased as the molting period is delayed from July until after November 1, except that the winter egg production was low for birds molting in November. Similar results were shown for the time hens stopped laying and the length of the idle period.

Studies in regard to xanthophyll, the natural yellow pigment of the egg yolk, body fat, and blood serum of the hen.—Chicks fed rations devoid of xanthophyll, but containing as high as 30 per cent of butterfat, which is rich in the yellow pigment carotin, showed a complete absence of yellow coloring in the visible skin parts, indicating that chicks are unable to utilize carotin.

Care and management of baby chicks, W. C. THOMPSON and N. R. MEHRHOF (*New Jersey Stas. Circ. 169 (1924), pp. 32, figs. 30*).—This circular consists of a popular discussion of the methods of care, management, feeding, and housing of baby chicks and suggestions for the prevention of diseases.

How to pedigree chicks, S. J. MARSDEN (*Nebr. Agr. Col. Ext. Circ. 1417 (1924), pp. 8, figs. 10*).—The method of pedigreeing chicks used at the University of Nebraska is described.

Summer care of the young stock, G. S. VICKERS and R. E. CRAY (*Ohio Agr. Col. Ext. Bul., 19 (1923-24), No. 8, pp. 4, fig. 1*).—The methods of care and feeding of broilers and pullets are briefly discussed.

The poultry industry, R. BOURLAY (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 2, pp. 244-249, figs. 3*).—A description of poultry practices in South Africa.

Ostrich farming, F. C. SMITH (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 2, pp. 238-243, figs. 4*).—A description of ostrich farming and plume production in South Africa.

DAIRY FARMING—DAIRYING.

[Dairy cattle experiments at the Missouri Station], A. C. RAGSDALE ET AL. (*Missouri Sta. Bul. 210 (1924), pp. 43, 44-47, fig. 1*).—In addition to brief summaries of the series of studies on milk secretion and the growth of dairy cattle, the last papers of which were previously noted from other sources (E. S. R., 50, pp. 578, 874), and the experiments in raising calves on milk substitutes (E. S. R., 50, p. 781) and the inheritance of the capacity for fat production (E. S. R., 50, p. 874), the results of an experiment dealing with the minimum protein requirements of calves are given. Normal growth was made by both Jersey and Holstein calves when receiving 82.1 and 64.4 per cent, respectively, of the Wolff-Lehmann and Armsby protein standards. Holstein heifers made normal growth in weight when 11 per cent of the total net energy for maintenance plus growth was furnished by the protein in the ration. Jersey heifers likewise made normal growth when 18.4 per cent of the net energy was supplied by the protein. Higher protein planes were much more efficient in promoting growth in weight with Holsteins than with Jerseys.

Zoometrical research on black and white cattle in the Province of Poznań (Greater Poland) [trans. title], T. KONOPIŃSKI (*Rocz. Nauk Rolnicz., 10 (1923), No. 3, pp. 570-602, pls. 3, figs. 18*).—From the English summary of this work, the results of a statistical study of 159 Friesian cows are reported from three different estates. The following coefficients of correlation were determined between the different measurements: Total length of head and length of pelvis 0.81, total length of head and length of forehead 0.6, height at withers and length of forelegs 0.4, height at withers and width of body 0.37, height at withers and breadth of chest 0.44, height at withers and depth of chest 0.41, height at withers and circumference of chest 0.31, height at withers and breadth of pelvis 0.37, height at withers and length of pelvis 0.27, breadth and depth of chest 0.287, length and breadth of pelvis 0.36, length of pelvis and breadth of buttocks 0.7, and width of body and depth of chest 0.17. The average measurement of each part and the standard deviation and coefficient of variability are also given.

The relation between the initial rise and the subsequent decline of milk secretion following parturition, S. BRODY, C. W. TURNER, and A. C. RAGSDALE (*Jour. Gen. Physiol., 6 (1924), No. 5, pp. 541-545, fig. 1*).—The rise of the curve of milk secretion for a short period following parturition has been found to be represented by the equation of a monomolecular chemical change

$$M=B\left(1-e^{-k_2t}\right)$$

Then by combining this equation with the equation expressing the decline of milk secretion with the advance in lactation (E. S. R., 49, p. 375), the rising and declining course of milk secretion throughout the lactation can be represented by the equation

$$M=Ae^{-k_1t}-Be^{-k_2t}$$

in which M is the pounds of milk produced per day, t days after calving, k_1 is the percentage decline in milk production per day on the declining segment of the curve, while k_2 represents the daily percentage decline of the rising segment of the curve; e is the base of natural logarithms; A is the theoretical initial milk production of the declining segment of the curve and B is the corresponding constant of the rising curve.

It is theoretically assumed in explanation of these results that a substance X is produced at parturition, which is changed to Y, and this in turn to Z. When Y is formed faster than it is being changed to Z, milk secretion is increasing, but when Y is being changed to Z faster than it is being formed, milk secretion is on the decrease.

Condensed and powdered buttermilk for dairy calves, C. H. ECKLES and T. W. GULLICKSON (*Jour. Dairy Sci., 7 (1924), No. 3, pp. 213–221, figs. 4*).—The results of a test of the use of condensed and powdered buttermilk for raising dairy calves are reported from the Minnesota Experiment Station. The condensed buttermilk used was about three times as concentrated as fresh buttermilk and, therefore, in the feeding it was diluted with three parts of water. The powdered buttermilk was diluted with nine times its weight of water. In conducting the experiments whole milk was fed during the first 10 to 14 days, with gradual changes to buttermilk. The calves were also given aflalfa hay and a grain mixture consisting of corn meal, wheat bran, and linseed oil meal, 4:1:1.

In the first experiment 1 Jersey bull and 1 Guernsey heifer received condensed buttermilk to 105 days of age, while 2 Guernsey heifers and 1 Jersey bull received powdered buttermilk to 150 days of age. In the second experiment 5 Holstein calves received powdered buttermilk, 3 being weaned from the buttermilk at 70 days of age while 2 were continued to 150 days of age.

The authors state that good growth was made by all calves, the average daily gains to 6 months of age varying in the first experiment from 1.24 to 1.65 lbs. and in the second experiment from 1.19 to 1.46 lbs. The calves weaned at 70 days received somewhat of a setback, from which they did not entirely recover at 6 months, but due to the larger amounts of buttermilk consumed, the long feeding seems hardly justified. No digestive troubles were observed, though the calves receiving buttermilk showed a slight looseness of the bowels, more than is customary with skim milk feeding.

[Papers on dairy bacteriology] (*Abs. Bact., 8 (1924), No. 1, pp. 15–20*).—The following papers on dairy bacteriology were among those presented at the twenty-fifth annual meeting of the Society of American Bacteriologists and are noted from the authors' abstracts:

Bacterial counts on milk bottle caps with a comparison of the effect of different methods of capping on such bacterial counts, **J. L. Rice, A. I. Van Saun, and K. E. Haywood.**—In tests of various makes of milk bottle caps as to their bacterial inoculation of milk, it was found that many were apparently free from bacteria. The cleanliness of the capping machinery varied to some extent, and when dirty the inoculation of bacteria into the milk was greater.

A suggestion for routine tests of the capping machinery by the use of sterile water in the milk bottles is given.

The importance of cell grouping in the direct microscopic counting of bacteria in market milk, I. Kennedy.—Seventy comparisons were made between the colony count of market milk as determined on standard agar plates, and the total bacteria and the groups of bacteria as determined by the Breed microscopic count. A fairly definite relation between the plate count and the groups of bacteria was observed, which averaged 1 to 13, but no relation between the plate count and the total bacteria was evident. The divergence in the latter case was greater when the bacterial counts were high.

Variations in the cell grouping of pure cultures of market milk bacteria, P. W. Allen.—Twenty-seven organisms isolated from the market milk of Pullman, Wash., were studied as to the variation in cell grouping of each when grown in milk. The results obtained indicate that in 80 per cent of the organisms the average size depends upon the time and temperature. It was further shown in the study that little relationship existed between the total microscopic count and the standard agar plate count.

The direct counting of bacteria in market milk by an improved hydroxide concentration method, P. W. Allen.—The use of a brass centrifuge tube, 23 mm. in diameter with a flat removable screw bottom, is suggested for use with the aluminum hydroxid method for the direct counting of bacteria in milk. In making the test 19 cc. of milk and 5 cc. of water suspension of aluminum hydroxid are shaken in the tube. A cover glass is dropped in the bottom, and, after centrifuging, the hydroxid film is dried on the cover glass, after which it is stained by the usual methods. It is stated that this test not only gets a more uniform spread of the aluminum floc over the cover glass, but also is an indicator of the presence of insoluble dirt.

The influence of beef extract on the bacterial counts of raw and pasteurized milk, R. C. Van Horn.—Comparative tests of the bacterial content of 40 samples of pasteurized milk, using Difco beef extract and Liebig's style beef extract, with Witte's peptone in each case, have indicated that about three times as many colonies occurred on the former media as on the latter. With raw milk, however, the counts were only slightly higher on Difco beef extract agar.

The probable error of the plate count in the bacteriological examination of milk, A. C. Fay.—The probable error, as determined from 100 plate counts on each of 10 samples of milk, was found to vary from 6 to 28 per cent, the smallest probable errors occurring when the colonies varied from 100 to 300 per plate. The use of statistical methods as an aid in substantiating disputable results is recommended.

Observations on the increase of bacterial count during the pasteurization process, A. R. Taylor.—Increases in the bacterial counts of milk during pasteurization which have been observed are tabulated without comment.

Influence of the period of operation of the pasteurizer upon the bacterial count of milk, J. D. Hungerford and H. A. Harding.—Plate counts are tabulated of pasteurized milk taken at different intervals from a continuous flow pasteurizer and held in storage until the next morning. The average counts during the first hour of operation were low, but after 3.5 hours rapid increases were observed. Apparently bacterial growth was occurring in the pasteurizer during the period of operation.

Thermophilic bacteria from milk, F. W. Tanner.—Studies of thermophilic bacteria have indicated that organisms of this type are apparently not abun dant in raw milk, but they increase very rapidly during a high incubation period (55° C.).

Observations on thermophilic bacteria in milk from farms, F. O. Adams and H. A. Harding.—A study of the thermophilic bacterial content of common raw milk, class A (raw) milk, and certified milk is reported. The samples were plated when raw, after pasteurizing 0.5 hour, and after holding for longer periods varying from 3.5 to 24 hours at 143 to 145° F. Thermophilic organisms were present in 28.2 per cent of the common milk, 43.7 per cent of class A milk, and 40.4 per cent of the samples of certified milk.

Thermophilic bacteria in composite samples from milk plants, H. A. Harding and A. R. Ward.—This is a similar study to the above of samples of mixed milk taken from the storage vats of a milk plant. The longer holding periods resulted in counts markedly higher in most cases than those made at the end of 30-minute periods. A number of samples showed higher counts after pasteurization than before.

A probable explanation of high counts (pin point colonies) in pasteurized milk, L. H. Cooledge.—A study of the most favorable media for the growth of thermophilic colonies indicated that thermophiles grow more rapidly on media having a reaction of about pH 7.3, whereas the usually recommended media for milk work having a pH 6.5 to 6.6 does not show any growth of thermophiles except they be in very large numbers. This probably accounts for the wide differences in counts of the same samples of milk from different laboratories. These organisms seem to be favored by efficient pasteurization as judged by the usual recommended methods.

Cream production, J. P. Lamaster and C. G. Cushman (*Clemson Agr. Col. S. C., Ext. Bul. 63 (1924), pp. [2]+29, figs. 22*).—This deals mainly with the necessity of cleanliness of utensils and thorough cooling of milk for the production of cream of good quality.

Experiments in the production of sour milk cheese [trans. title], E. Haglund (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 223 (1922), pp. 17*).—The results of experiments carried on during 1920 and 1921 have shown that sour but not coagulated milk may be used for cheese production when a part of the acidity is neutralized with sodium hydroxid or sodium carbonate and the milk is afterward pasteurized. Milk treated in this way must have a relatively high acidity in order that curdling may be normal. The use of calcium or magnesium compounds for neutralization was not so satisfactory as the sodium, since the latter compounds tended to produce a slight amount of coagulation during pasteurization.

The use of calcium chlorid in cheese making [trans. title], L. Lindet (*Lait, 4 (1924), No. 31, pp. 2–7*).—Favorable results have been obtained from the use of small amounts of calcium chlorid (1 gm. per liter of milk) in the manufacture of cheese at several dairies. When the calcium chlorid was used the curd formed quicker, the quality of the cheese was improved, and the yield was increased. No danger was evident from its use, as it was changed to calcium phosphate in the cheese and to sodium chlorid in the whey, so that the whey could be satisfactorily fed to animals.

The use of calcium chlorid in the manufacture of Maroilles cheese [trans. title], E. Vaillant (*Lait, 4 (1924), No. 31, pp. 7–10*).—In three comparative tests in which 1 gm. of dry calcium chlorid or 2 gm. of crystals were added per liter of milk for cheese making, the milk curded quicker, drained faster, the whey was clearer, and in two of the tests the yields of cheese were about 7 per cent greater.

The effect of each ingredient in the manufacture of ice cream, W. H. E. Reid and D. H. Nelson (*Missouri Sta. Bul. 210 (1924), pp. 47, 48*).—A continuation of this experiment (E. S. R., 48, p. 672) has included results on 182 freezings. A direct relationship was apparent between the sugar content of the ice cream and its hardness and ability to withstand summer temperatures. An increased butterfat content increased the viscosity and overrun, and decreased the time required in freezing.

VETERINARY MEDICINE.

Report of the proceedings of the twenty-seventh annual meeting of the United States Live Stock Sanitary Association (*U. S. Livestock Sanit. Assoc. Rpt., 27 (1923), pp. 159*).—The papers presented at the annual meeting of the association held at Chicago in December, 1923, include the following: Sources of Infection in Primary Outbreaks of Hog Cholera, by I. K. Atherton; Supplemental Studies of Post Vaccination Troubles, by E. A. Cahill; Safe Regulations for Cholera Control in the Movement of Stock Hogs, by H. A. Wilson; Report of Committee on Hog Cholera Control; Nutritional Diseases of Cattle and Swine, by H. C. Kernkamp; Nutritional Diseases of Poultry, by J. R. Beach; A Review of the Year's Work in Tick Eradication, by W. M. MacKellar; Breeding Efficiency in Purebred Dairy and Beef Cattle, by W. L. Boyd; The Experimental Production of Bang Abortion Disease, by R. R. Birch and H. L. Gilman; Progress and Status of Cooperative Tuberculosis Eradication Work, by J. A. Kiernan; Salvage of Reactors from the Standpoint of the Packers and the Owners, by E. C. Brown; Suggestions for Private Practitioners Conducting Tuberculin Tests under the Accredited Herd Plan, by C. H. Case; Agencies through which Bovine Tuberculosis is Disseminated, by E. C. Schroeder; and The Relation of Indemnity to Tuberculosis Eradication, by W. B. Lincoln.

Report on the operations of the veterinary sanitary service of Paris and the Department of the Seine during the year 1923 [trans. title], H. Martel (*Serv. Vét. Sanit. Paris et Dépt. Seine, Rap. Opér., 1923, pp. 160, figs. 2*).—This is the annual report (E. S. R., 51, p. 381).

Report of the chief veterinary surgeon for the year 1923, J. M. Sinclair (*South. Rhodesia, Chief Vet. Surg. Rpt. 1923, pp. 11*).—This report deals particularly with African coast fever and contagious abortion of cattle. The latter disease was discovered at 40 centers where its existence had not been previously known.

The rôle of the skin in infection and in immunity against anthrax [trans. title], H. Plotz (*Ann. Inst. Pasteur, 38 (1924), No. 2, pp. 169–178*).—The general principles of local cutaneous immunity established by Besredka (E. S. R., 47, p. 786) have been confirmed by experiments conducted on rabbits. Rabbits inoculated subcutaneously with a strong dose of anthrax virus survived but acquired only a slight immunity, if any, while those inoculated cutaneously with attenuated virus acquired a high degree of immunity.

Experiments on the production and action of antiaggressive anthrax serum [trans. title], T. Matsumoto (*Ztschr. Immunitätsf. u. Expt. Ther., 40 (1924), No. 4–5, pp. 402–428*).—Experimental data are reported showing that rabbits can be actively immunized against anthrax by means of the sterile exudate of the skin edema of infected rabbits, and on longer treatment, together with the injection of nonsterile exudate, yield a passive protective serum. The results are discussed and explained from the standpoint of aggressin immunity, and it is pointed out that they are in accord with the Besredka theory of the dermatopathic nature of anthrax. In similar experiments guinea pigs were immunized with greater difficulty than rabbits, thus indicating a smaller content of aggressin in their body fluids.

Vaccination of the horse against anthrax by the cutaneous method [trans. title], Brocq-Rousseu and Urbain (*Ann. Inst. Pasteur, 38 (1924), No. 3, pp. 268–272*).—Three experiments are reported on the successful immunization of horses against anthrax by the cutaneous method of Besredka (E. S. R., 47, p. 786.) It was found possible to confer immunity by two injections, the first consisting of 2 cc. of first vaccine fractionally injected in 20 different places and the second three days later of 0.25 cc. of second vaccine injected in 2 different places in the skin of the neck. The injections were followed by no other symptoms than slight local edema. The injection from 10 to 13 days later of 1 cc. of virulent culture was followed only by slight local edema, with no rise in temperature. In no case was the establishment of immunity accompanied by the appearance of antibodies in the blood serum.

Rapidity of immunization of sheep against anthrax by a single intradermal vaccination [trans. title], H. Velu (*Bul. Soc. Cent. Méd. Vét., 100 (1924), No. 12, pp. 277–280*).—Essentially noted from another source (E. S. R., 51, p. 283).

Leptospira icterochaemorragiae in rats in Warsaw [trans. title], L. Anigstein (*Compt. Rend. Soc. Biol. [Paris], 89 (1923), No. 37, pp. 1358, 1359*).—The author finds that in certain parts of Warsaw 20 per cent of the rats are infected with *L. icterochaemorragiae.*

Experimental ingestion of the human and bovine types of Bacillus tuberculosis by chickens and pigeons, K. Zschernitz (*Fütterungsversuche mit vom Menschen und vom Rinde Stammendem Tuberkulösen Material an Hühnern und Tauben. Inaug. Diss., Univ. Leipzig, 1923, pp. 16*).—In feeding experiments with these domestic fowl, the author was unable to produce tuberculosis with the human and bovine types of the organism.

Infectious abortion in cattle and swine, J. W. Connaway, A. J. Durant, and H. G. Newman (*Missouri Sta. Bul. 210 (1924), pp. 71–76*).—In this progress report records are given of two experimental cattle herds and a third herd containing reactors.

The first herd, consisting of more than 100 dairy cattle of various ages, was once badly infected with the Bang abortion disease, but as the result of systematic tests and gradual elimination of reactors had at the time of writing only 1 reactor. Isolation and disinfection for a few weeks at the calving period have prevented the spread of infection from this cow, as shown by the fact that no abortions have occurred in the herd during the year and that serological tests for abortion antibodies have been negative with all the animals except the reactor and its calf.

"This experiment adds further confirmation to the conclusions previously reported that an immune 'abortion reactor' does not as a rule discharge the Bang abortion infection in dangerous quantity except for a short period coinciding with the last several days of gestation, and the cleaning period of approximately four to six weeks following parturition."

The work in the second experimental herd was concerned chiefly with 5 cows which had been artificially infected in 1918 with laboratory cultures of *Bacterium abortus* and had been kept isolated from other cattle except their own calves and a nonreacting bull. All of the cows reacted persistently to the serological tests. Four had calved and one had failed to come in heat and was not bred. Cultures of *B. abortus* were obtained from the colostral milk of 2 of the cows during the year. It is concluded that the persistence of the serological reactions was due to the presence in the animals of the living *B. abortus* organism.

The afterbirths of 2 of the reacting cows which had calved normally were used for inoculations into guinea pigs and also for feeding a pregnant nonreactor. The blood serum of the guinea pigs gave no tests for *B. abortus*, although the colostral milk of 1 of the cows when injected into other guinea pigs caused a positive reaction to develop in the blood serum. The cow which had been fed the afterbirths calved only one day prematurely. A blood sample from this cow was negative, but the colostral milk and the blood of the calf gave positive reactions. In the case of a heifer which had been fed afterbirths of reactors while pregnant, the blood developed a positive reaction between the sixty-second and eighty-ninth day, and the milk showed a positive reaction after four months or more.

The third herd consisted of purebred beef cattle in which aborting animals had been allowed to remain in contact with healthy animals. At the time of the first test there were only 3 reactors among 57 breeding cows, but in 18 months the number of reactors had increased to 45. Some of these were slaughtered, leaving 33 reactors and 6 nonreactors of breeding age in the herd during the year. The nonreactors showed 100 per cent breeding efficiency and the reactors 63.6 per cent, an increase over the preceding year. This is thought to indicate a lessening of the virulency of the infection in the herd or an increased resistance.

The present status of abortion disease in cattle, its spread, influence of male, and control, W. E. COTTON (*Vet. Med., 19 (1924), No. 8, pp. 463–469*).—This is a contribution from the U. S. D. A. Bureau of Animal Industry.

Technic and comparative studies of the agglutination and complement-fixation tests for bovine infectious abortion, F. BOERNER, JR., and E. L. STUBBS (*Jour Amer. Vet. Med. Assoc., 65 (1924), No. 4, pp. 425–432*).—A detailed description is given of the technique employed by the authors at the laboratory of the Pennsylvania Bureau of Animal Industry in the agglutination and complement fixation tests for bovine infectious abortion, and data are reported on the use of these tests alone and in combination in routine work covering a period of nearly three years.

The results are classified in the usual way as positive, weakly positive, suspicious, and negative. In the combination test the results are considered positive if either test alone is positive and both are weakly positive; as weakly positive if weakly positive to one test and suspicious or negative to the other, or if suspicious to both tests; as suspicious if suspicious to one test and negative to the other; and as negative if negative to both tests. As thus classified in the combination test, 1,164 sera were classified as positive. This represents an increase of 6.9 per cent over the number classified by the complement fixation test alone and of 27.5 per cent over the agglutination test. The 141 sera classified as weakly positive were 77.2 per cent above and 13.6 per cent below the numbers similarly classified by the complement fixation and the agglutination test, respectively. The 111 sera classified as suspicious were 25 and 58.2 per cent and the 2,533 sera classified as negative 3.7 and 2.7 per cent less than the number thus classified by the complement fixation and agglutination tests, respectively.

It is concluded that the two tests applied alone have about the same value, although the reactions to the complement fixation test are more decisive, and that a combination of the two tests is more accurate than either test alone.

Studies of the value of vaccines and bacterins in immunizing cattle to Bact. abortus (Bang), C. P. FITCH and W. L. BOYD (*Jour. Amer. Vet. Med. Assoc., 65 (1924), No. 4, pp. 407–424*).—This contribution from the Minnesota Experiment Station consists of a report of the more important phases of an extensive investigation of the relative value of vaccines and bacterins in the immunization of cattle against *B. abortus*. The original animals, 14 scrub cattle of fairly good quality, were divided into three groups, one of which was injected with living abortion vaccines, another with bacterins, and a third left as controls. From time to time the groups were increased, generally by animals raised in the herd.

Both the vaccines and bacterins were prepared from a number of different strains of *B. abortus*, as many as 32 being used in the course of the experiment. Of these, two were of porcine and the rest of bovine origin. The living vaccine was prepared by growing *B. abortus* on agar, washing off the growth with saline, and diluting to the same density as tube 4 of the McFarland nephelometer. The vaccine was in all cases injected within a few hours after its preparation. The bacterins were prepared by washing off agar cultures with carbolized saline, heating the suspension at 56° C. for from 30 to 80 minutes, and finally diluting with carbolized saline to the same density as tube 5 of the McFarland nephelometer. In a few cases a bacterin prepared by means of CO_2 pressure, as described by Larson et al. (E. S. R., 38, p. 584), was used, but this method was finally abandoned on account of the difficulty in killing the organism. The inoculations of the vaccine were made in single or repeated doses about 60 days before breeding. The bacterins were injected at various intervals throughout the life of the animal.

The animals were first tested for immunity by the so-called natural infection method, or contact with cows which had recently aborted and were discharging abortion bacteria. This method was later considered unreliable and was substituted by artificial methods of drenching with suspensions of the live organism or by intravenous injection of similar suspensions.

The protocols and tabulated data are given of 11 cows injected with living organisms (group 1), 11 with killed organisms (group 2), and 7 controls (group 3). A summary of the data on these three groups is as follows: Number of sterile animals 1, 1, and 0; average age in years 3.5, 3.7, and 3; number of living calves 17, 17, and 10; percentage of healthy calves 63.6, 50, and 61.5; number of living calves with scours 3, 4, and 2; percentage of calves with scours 13.6, 15.4, and 15.4; number of pregnancies terminated by slaughter 4, 0, and 2; pregnancies per year 0.66, 0.65, and 0.71; services per pregnancy 2.6, 2.4, and 1.6; number of abortions following natural infection 1, 2, and 1; number of abortions following intravenous infection 4, 4, and 1; number of abortions following drenching 0, 3, and 1; and percentage of abortions 22.7 34.6, and 23, respectively.

In discussing these results, attention is called to the marked differences exhibited in individual susceptibility, the greater immunity induced by living virus than by the bacterin, and the lack of deleterious effects on the cattle exerted by living vaccine. It is concluded that vaccination with the living vaccine is not a dangerous procedure in herds which are badly infected with *B. abortus*. "The use of this product, however, should be confined to herds in which frequent abortions occur in the first and second pregnancies, which have been shown to be due to the Bang germ. The use of living vaccine will rarely, if ever, reduce the abortions below 10 to 15 per cent and in some herds not even to this level. It may, and probably does, reduce the amount of infectious material by reducing the number of cases of placental disease."

The occurrence of blue bodies as a developmental stage of Theileria mutans, T. M. Doyle (*Jour. Compar. Path. and Ther.*, *37* (*1924*), *No. 1*, *pp. 18-27*).—It is pointed out that the theileriosis of bovines in Egypt and the Sudan, known as Egyptian fever, and the theileriosis of bovines in Tunis is the same disease. Blue bodies indistinguishable from those of East Coast fever have been found in 7.5 per cent of recurrent cases of *T. mutans* infection in Cyprus cattle, but no blue bodies have been found in adult Egyptian cattle. The author's investigation has led to the conclusion that blue bodies are found in only a small percentage of cases of the disease, and then only when fever has existed for at least five or six days. The rarity of blue bodies in adult native cattle infected with *T. mutans* is probably due to their great tolerance to the parasite, in consequence of which severe relapses of the disease seldom occur.

Vibrionic abortion in sheep, H. WELCH and H. MARSH (*Jour. Amer. Vet. Med. Assoc., 65 (1924), No. 2, pp. 203–210, fig. 1; abs. in Jour. Compar. Path. and Ther., 37 (1924), No. 2, pp. 128–131*).—The authors report upon investigations conducted in Montana, where losses of lambs from abortion have occurred sporadically for some years without the cause having been definitely determined. The present account is based upon field and laboratory investigations made during the lambing season of 1923 on three widely separated flocks of sheep in which abortion appeared at about the same time. In all these cases the immediate cause of abortion was found to be infection with a vibrio which corresponded in morphology and in biological and cultural characteristics with that originally described by McFadyean and Stockman (E. S. R., 30, p. 684). The authors point out that the only previously published report of this form of abortion in sheep in the United States is that of Carpenter, on its occurrence in a band of ewes in New York (E. S. R., 42, p. 570). It is also pointed out that the disease occurred in enzootic form and apparently has no tendency to become epizootic. The agglutination tests on sheep indicate that these have a definite diagnostic value. Examination of water from a shallow well located in the corral where the sheep were fed, which was contaminated with surface water from the corral, showed the presence of a spirillum similar in morphology to the vibrio recovered from aborted fetuses.

Pernicious anemia of the sheep and of the goat [trans. title], A. DONATIEN and F. LESTOQUARD (*Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 26, pp. 2203, 2204*).—The authors conclude that in Algeria there occurs a disease of the sheep and goat due to a filterable virus which is transmissible to the sheep, goat, ass, and calf. It is characterized by a progressive anemia bordering upon cachexia, and death. The suprarenal lesions dominate in its pathology. The disease offers striking analogies with pernicious anemia of the horse, as studied by Carré and Vallée, and the authors propose the name pernicious anemia of the sheep and of the goat.

The etiology and pathology of the filterable swine diseases—hog cholera and contagious broncho-pneumonia, F. PROESCHER and H. A. HOFFMAN (*Jour. Compar. Path. and Ther., 37 (1924), No. 2, pp. 73–106, figs. 12*).—During the past two years the authors have conducted over 200 experiments with the filterable virus disease, the material having been obtained from field cases and different brands of commercial viruses, as well as from a number of serum-test pigs which died unexpectedly during the Government serum tests, and from hogs which succumbed after hyperimmunization with the virus blood. A careful analysis of the temperature reactions, clinical symptons, and pathological changes has convinced them that the filterable virus disease must be separated into two entities, and in the present paper they give concrete, typical examples of both filterable virus diseases. The clinical course and the gross and microscopical lesions, as well as the causative microorganisms, are described and compared with the filterable virus disease as heretofore described in literature.

The minute coccus which in earlier investigations (E. S. R., 37, p. 782) was demonstrated in blood smears from hog cholera pigs through the use of methylene-azur-carbonate stain or a combined staining method, using a methyl alcoholic solution of eosin-methylene-blue-toluidin-blue stain and diluted Giemsa stain, was found in desquamated endothelial cells circulating in the blood stream or attached to the red blood corpuscles as well as extracellularly. Their form was either spheroid or ovoid, and about 0.2 μ in diameter, just on the limit of the microscopic visibility.

The pathology of a certain deficiency disease in pigs often named "posterior paralysis," S. A. Goldberg and L. A. Maynard (*Cornell Vet., 14 (1924), No. 2, pp. 141–144, pls. 4*).—This is a report of studies conducted at Ithaca, N. Y., of a deficiency disease which seems to be caused by winter feeding of certain diets. The authors find that apparent cures have been brought about by adding alfalfa and cod liver oil. The lesions occur in the long bones, mostly in the femoral heads, and in the kidneys. Certain symptoms and lesions in posterior paralysis resemble those that are considered diagnostic of hog cholera.

Bone disease in horses.—A clinical study, E. F. J. Bordeaux (*Jour. Compar. Path. and Ther., 37 (1924), No. 1, pp. 27–37*).—This is a report of a clinical study of the disease described by British veterinarians as osteoporosis and by some continental authorities as osteomalacia.

On the "esponja" (cutaneous habronemiasis) of equines in Brazil [trans. title], C. Magarinos Torres, O. da Fonseca, and A. E. Arêa Leão (*Compt. Rend. Soc. Biol. [Paris], 89 (1923), No. 27, pp. 764, 765*).—The authors report upon three cases of esponja (cutaneous habronemiasis) studied in Brazil additional to three previously recorded.[5] The affection is said to differ from summer sores in its clinical characteristics, particularly the greater size of the cutaneous lesions, and above all by its long duration, often lasting for a year and continuing to enlarge. About 17 per cent of the flies taken in the stables of the Oswaldo Cruz Institute were found to contain the Habronema.

On the "esponja" (cutaneous habronemiasis) of equines: Parasitism of flies by Habronema muscae (Cart.) [trans. title], C. B. de Magarinos Torres, O. da Fonseca, and A. E. de Arêa Leão (*Compt. Rend. Soc. Biol. [Paris], 89 (1923), No. 27, pp. 767, 768*).—In examination of 75 horses and 14 asses in the serological service of the Oswaldo Cruz Institute at Rio de Janeiro, 5 horses and 2 asses, or a total of 7.8 per cent, were found to be suffering from esponja. Examinations were made of the heads of 164 adult house flies collected near the stables of the institute, and larvae were found in 42. Eighteen of the flies each contained a single larva, nineteen contained 2, two 3, one 4, one 5, and one 9 larvae. *H. muscae* is considered to be the nematode which is the most important and possibly the exclusive causative agent of this affection, while summer sores in Europe are caused by *H. megastoma* Rud.

Bacillary white diarrhea in poultry, H. R. Baker (*Jour. Amer. Vet. Med. Assoc., 65 (1924), No. 3, pp. 349–352*).—A review and discussion of recent literature on the subject.

An outbreak of avian spirochaetosis: The protective and curative action of neosalvarsan [trans. title], C. Cernaianu (*Arch. Vet., 17 (1923), No. 4–5, pp. 80–84; abs. in Trop. Vet. Bul., 12 (1924), No. 2, pp. 53, 54*).—The author reports that a single intramuscular injection of 0.0375 gm. per kg. of neosalvarsan was sufficient for the cure of birds which had reached even the third or complete paralysis phase of the disease. Parasites had practically disappeared from the blood within three hours of the injection, and none could be found after five hours. Thirty-one birds in various stages were treated, apparently with success in every case.

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[5] Brazil Med., 37 (1923), No. 22, p. 301.

RURAL ENGINEERING.

Agricultural engineering [studies at the Missouri Station] (*Missouri Sta. Bul. 210 (1924), pp. 32–34*).—The results of 164 tests on the draft of wagons under various road and field conditions and with different sizes of wheels and widths of tires, by J. C. Wooley and M. M. Jones, are briefly summarized. The results are said to check more closely with the rule that the draft varies directly with the load and inversely with the radius of the wheel than with rules using the square root or the cube root of the radius. Wide tires decreased the draft. Coefficients of rolling friction were established of 0.508 for worn brick pavement, 0.366 for new brick pavement, 0.417 for concrete pavement, 1.814 for dry dirt road, 1.93 for muddy dirt road, 0.565 for gravel road, and 0.755 for cinder road.

The results of 150 tests on the draft of plows, by Jones, are said to have shown an average draft per square inch for the furrow slice in corn stubble of 5.04 lbs.

Data on the cost of producing electricity from a 32-volt farm plant, by Wooley, are also briefly included.

Specification record, The American Specification Institute, edited by G. C. Coughlen (*Chicago: Amer. Specif. Inst., 1923, vol. 1, pp. 398, illus.*).—The purpose of this volume is to organize the work of specification writing and to point a way to studious endeavor on the part of all progressive writers of specifications.

Maintaining the productivity of irrigated land, D. W. Pittman (*Utah Sta. Bul. 188 (1924), pp. 3–24, figs. 7*).—The results of 21 years of experiments and observations of soil fertility conditions on the Greenville Experiment Farm north of Logan, Utah, are presented.

It is stated that the soil of this farm is typical of much of the good irrigated land of the State, producing good yields of all the ordinary crops except sugar beets. It produces good crops of the latter when well manured, and this crop is said to be much more responsive to manuring than any of the other crops studied. It has been found that sugar beets grown continuously or in rotations without manure tend to decrease slightly in yield.

Corn, small grains, and alfalfa were more exhaustive to the soil, as measured by subsequent sugar beet production, than were potatoes, sugar beets, or summer fallow. The more irrigation water applied the more rapid was the exhaustion of the soil. The heaviest yearly application of manure (40 tons per acre) resulted in the largest yield of sugar beets. The value of the manure per ton was very much greater when it was applied in small, thin applications.

Next to sugar beets, potatoes showed the greatest returns from the use of manure. The small grains showed only moderate returns from manure applications and were injured by very heavy applications. The continuous growth of small grains without manure was very exhaustive to the soil, and rotation even without manure increased their yield.

Alfalfa showed a good response to the residual effect of the manure applied earlier in the rotation. Good increases in the yield of corn were obtained from manure applications. Manure was relatively somewhat more beneficial with insufficient or excessive than with optimum irrigation. It was found possible to maintain the nitrogen content of this soil by a rotation system in which about one-third of the land is kept in alfalfa and the manure produced from feeding this alfalfa returned to the land.

Effect on crops of brackish irrigation water, J. C. Ripperton (*Hawaii Sta. Rpt. 1922, pp. 17, 18*).—Studies to determine the tolerance of alfalfa, rice, and

Napier grass in lysimeters to measured quantities of water containing varying amounts of sodium chlorid are said to have shown that alfalfa withstood a greater percentage of salt when once well established than when it was in the seedling stage.

Motor driven irrigation pumping plants and the electrical district, G. E. P. Smith (*Arizona Sta. Bul. 99 (1924), pp. 67–141, figs. 21*).—The primary purpose of this bulletin is to supply practical information on motor-driven pumping plants, both for those who desire to change their pumping plants from engines to motors and for those who desire to install new motor-driven pumping plants. General discussions of wells and pumps are included, and an explanation of the legal character, function, and operation of electrical districts is also presented.

Discharge measurements for the control section weir, J. L. Savage (*Engin. News-Rec., 92 (1924), No. 20, p. 842, figs. 3*).—Data from experiments conducted by the U. S. Department of Interior Bureau of Reclamation on a new type of measuring structure known as the control section weir are briefly presented and discussed.

It is shown that the control section weir is superior to the sharp crested weir or to the Venturi flume in several respects. It requires less fall than the sharp crested weir and can be so constructed that no pool is required above. As compared with the Venturi flume it has the advantage of requiring only one reading, which may be taken in the smooth water above the control notch upon an ordinary weir gauge. Furthermore, the observed head, which is the total depth over the bottom of the control notch, is much greater than the difference in head observed for a Venturi flume, and is therefore less affected by small errors in observation.

Further studies of discharge through adjustable submerged orifices, H. A. Wadsworth (*Engin. News-Rec., 92 (1924), No. 20, pp. 866, 867, figs. 3*).—In a contribution from the University of California the results of 107 observations made on a new submerged orifice at the hydraulic laboratory at Fort Collins, Colo., are summarized. The openings ranged in size from 0.25 to 2.25 sq. ft.

Tests of loss of head in standard elbows and tees, L. Perry (*Engin. News-Rec., 92 (1924), No. 22, p. 940, fig. 1*).—Experiments conducted at Lafayette College showed that the losses of head through standard 1, 1.5, 2.5, and 3-in. wrought iron elbows were $0.016v^2$, $0.014v^2$, $0.011v^2$, and $0.01v^2$, respectively, in which v is the velocity of flow in feet per second. In the formula $H=k(v^2/2g)$, in which H is loss of head, it was found that the constant k had respective values for the four sizes of elbow of 1.04, 0.91, 0.71, and 0.64.

Similar investigations with four standard 1, 1.5, 2.5, and 3-in. tees showed that the losses of head were $0.0084v^2$, $0.005v^2$, $0.0031v^2$, and $0.0025v^2$, respectively, and the values of k, 0.54, 0.32, 0.2, and 0.16, respectively.

Tests on holding power of lead joints in water-pipe plugs, J. H. Quense (*Engin. News-Rec., 92 (1924), No. 20, pp. 867, 868, figs. 3*).—Tests to determine how much holding power the lead alone offers to prevent the plug from moving in 6, 8, 12, 16, and 20-in water-pipe joints are briefly summarized.

Effect of alkali on strength of mortar, C. E. Proudley (*Engin. and Contract., Roads and Streets, 61 (1924), No. 6, pp. 1205, 1206, figs. 2*).—Progress results of experiments conducted by the U. S. D. A. Bureau of Public Roads indicated that the presence of alkaline sulphates in the mixing water in quantities of less than 1.5 per cent has no serious effect on the strength or other physical properties of Portland cement mortar. One per cent alkaline solutions in contact with cement mortar in mixes of 1:2 and leaner cause a progressive decrease in the strength of the mortar. The decrease in strength of mortar subjected to alkali action may be somewhat accelerated by the presence of considerable quantities of alkali in the mixing water, and for this reason the use of pure water in mixing is considered advisable under such conditions.

Hitching horses to get the most work done, E. W. LEHMANN and E. T. ROBBINS (*Illinois Sta. Circ. 283* (*1924*), *pp. 8, figs. 8*).—Practical information on improved methods of hitching is presented.

Sugar dust explosions [trans. title], P. BEYERSDORFER (*Ztschr. Ver. Deut. Zuckerindus., 1922, No. 798, II, pp. 475–533, figs. 9*).—A survey of dust explosions in sugar refineries in Germany during the past 30 years is given, and studies extending over two years on the factors governing such explosions are reported.

It was found that the cause of sugar dust explosions can be either thermal or electrical. The combustion temperature of sugar dust in air was found to be 410°±1° C. (about 770° F.), and in oxygen about 371°. Ozone in small quantities decreased the temperature of combustion of sugar dust in air about 3° and in oxygen about 4°. The temperature of combustion was found to depend upon the oxygen content of the gases in which it was ignited and on the heat conductivity of the relatively inert gases which accompany the oxygen. Carbon dioxid had a greater extinguishing influence than nitrogen.

A graphic representation of the dependence of the combustion temperature of sugar dust upon the oxygen content of a mixture of oxygen and nitrogen showed that the curve proceeded asymptotically to the temperature axis. A parallel to the temperature axis through a point corresponding to 9 per cent of oxygen in the mixture represented the division of combustion into plain burning and explosion.

The explosion of sugar dust by heat was found to end in a gas explosion, and to consist of a gasification phase and an oxidation phase. The upper limits for a dust explosion in air corresponded to a mixture of 13.5 kg. of dust per cubic meter of air and the lower limit to 17.5 gm. per cubic meter.

Sugar dust was found to charge itself positively on passage through the air. A tension of more than 10,000 volts was caused by whirling agitation of sugar dust in air. Electrically charged sugar dust discharged when agitated in a gas. Sugar dust can therefore be exploded in a variable field. This electrical explosion has three phases. The first is the formation of ozone and nitrate, the second is the reaction of these substances with the finest sugar particles, and the third is the explosion proper resulting from the occurrence of this reaction in a variable field. Sugar dust forms a so-called aerosol with air. A sudden bringing about of the isoelectric point produces a flash which ignites the dust cloud. The violence of the explosion is attributed to the absorption of oxygen by the dust.

The practical significance of these results is discussed. The opinion is expressed that the surest method of preventing sugar dust explosions is to fill the pulverizing machines with relatively inert gases.

Swedish water power and the farmer (*Elect. World, 83* (*1924*), *No. 20, pp. 992–998, figs. 14*).—General information on the rural use of electricity in Sweden is presented, with particular reference to the financing of distribution systems by local farm cooperative societies. It is stated that 40 per cent of the land under cultivation in Sweden is now within the reach of electric transmission lines. Experience has shown, however, that unless all the customers are brought together from the very start and directly interested in the enterprise rural electrification plans are likely to fail. It has also been found necessary to employ a less expensive type of overhead line construction on rural lines than is used on other lines.

Studies by the Royal Board of Waterfalls have shown that in uniformly settled districts economical distribution is obtained by using an intermediate system of feeder lines as follows: From main high-tension substations, 20,000-volt feeders reach out to rural substations systematically scattered throughout the district, and from these rural substations energy is distributed at 3,000 volts to the individual farms, where it is further stepped down to 220 or 380 volts. In the more densely settled districts 1,500 volts is used on the intermediate lines, and if an out-of-the-way village is to be picked up a 6,000-volt line is employed. Under the method of distribution used, the investment in rural systems in Sweden is said to be about $9 per acre.

Electricity in dairy factories, C. Vowell (*New Zeal. Jour. Agr., 27 (1923), No. 5, pp. 310–314*).—Experiments on the use of electricity in dairies in New Zealand are briefly reported, the results of which demonstrated that dairy factories in Southland can not afford to use steam where electricity is available at reasonable rates. The electrical energy was found to be especially economical in the operation of separators.

Further experiments showed, however, that it is only by careful and scientific installation of motors of the correct power, specially designed for the particular machine they are to drive, that the maximum economy may be obtained. Collective driving by electricity, that is, driving the whole factory by one large motor is comparatively inefficient. Electricity for heating purposes in dairy factories does not show up to the same advantage that it does for power.

The care of farm gas engines, C. C. Johnson (*Washington Col. Sta. Pop. Bul. 129 (1924), pp. 3–51, figs. 31*).—Practical information on the operation and care of farm gas engines is presented.

Sprayers and spray equipment for orchard and garden, M. B. Cummings (*Vt. Agr. Col. Ext. Circ. 30 (1924), pp. 12, figs. 11*).—Illustrative and descriptive suggestions relating to the purchase and use of sprayers and spraying equipment for orchard and garden are presented.

Ice-making and cold-storage plants in Mexico, Central America, and West Indies (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 229 (1924), pp. II+66*).—The results of a questionnaire calling for particulars of ice making and refrigerator installations in these countries are summarized.

Air leakage around window openings, C. C. Schrader (*Jour. Amer. Soc. Heating and Ventilating Engin., 30 (1924), No. 6, pp. 465–474, figs. 8*).—In a second contribution to the subject (E. S. R., 51, p. 188), studies are reported on the effect of increasing the crack and clearance of windows on the leakage. A double hung wooden sash 2 ft. 8 in. by 5 ft. 2 in. by 1⅜ in. was used.

The results showed that the size of the crack around the perimeter of the sash has no appreciable effect on the leakage for a plain window. However, the leakage increased rapidly with an increase in clearance. With a weatherstripped window and a constant width of crack it was shown that the leakage also increased quite rapidly with an increase in clearance until the clearance equaled the crack, after which the increase in leakage was not so rapid.

The results obtained with the interlocking type of weather stripping were more consistent than those obtained with the rib stripping.

Investigations into the working of a slow-filtering sand-filter in the Tropics, P. C. Flu (*Meded. Burgerl. Geneesk. Dienst Nederland. Indië, No. 3 (1922), pp. 135–166*).—Investigations with Tjiliwoeng River water are reported.

The results indicate the impossibility of improving the turbid water of rivers flowing through the lowlands of Java either physically or bacteriologically by the use of coarse gravel filters. Treatment with aluminum sulphate and filtration through slow working filters was found to produce a filtrate satisfying all the requirements of good drinking water. The experiments showed that the influence of direct sunshine on the growth of the algae, or more generally on the surface of the filter, is of fundamental importance for good results. If the filter is kept in darkness, bacteriologically poor results are obtained. It was further found that a properly working sand filter in the Tropics is able to retain practically all of the pathogenic organisms in a polluted water.

RURAL ECONOMICS AND SOCIOLOGY.

The utilization of our lands for crops, pasture, and forests, L. C. Gray, O. E. Baker, F. J. Marschner, B. O. Weitz, W. R. Chapline, W. Shepard, and R. Zon (*U. S. Dept. Agr. Yearbook 1923, pp. 415–506, figs. 58*).—This article is an outgrowth of the work of the land utilization committee of the Department. Maps and graphs based largely upon estimates drawn up from census statistics and official reports indicate the present uses of our land resources; the land potentially available for crops, pasture, or forest; and the increasing scarcity of land resources and the nature of this scarcity. The trend toward increasing scarcity of land resources is said to have been obscured temporarily by the existing agricultural depression with its attendant overdevelopment of farm production for export and by the fact that we are still cutting our timber largely from the stored crop. The effort is made to determine what proportion of the productive area of the United States is employed in production for export, as well as to what extent the importation of agricultural and forest products reduces the amount of land that would otherwise be required to supply existing needs.

The probable increase for 10 important crops which occupy practically 90 per cent of our entire crop area is estimated. An average practicable percentage increase of 46.8 in production per unit of crop area when economic conditions shall justify the requisite cost of production is regarded as possible. If this increase in yield in crop land could be achieved by the time our population reaches 150,000,000, or in 1952, as suggested by Pearl, we should require for domestic consumption about 34,000,000 acres less than we used for domestic consumption in 1920. It is pointed out, however, that such an increase probably can not be made in less than three decades, especially in view of the fact that there has been no increase in average crop yields per acre in the last two decades. Estimates are made of the economy in acreage which might result from changes in standards of consumption. Comparisons are made between the use of crop and pasture land and the consumption of forest products under European standards and that of the United States. The principal changes which are to be looked for in the next few decades are said to be in the consumption of livestock products.

On the basis of the assumptions of probable modifications in per capita consumption and of increase in productiveness of crop land and in the carrying capacity of pasture, it is held that we shall require for a population of 150,000,000, three or four decades hence, about 373,000,000 acres of crop land and about 222,000,000 acres of humid pasture other than woodland, the areas of semiarid pasture and of woodland being held constant as in previous estimates. This estimate makes no allowance for exports and assumes the continuance of the present per capita imports of agricultural products. Finally when all allowances are made, it is estimated that a maximum population of 350,000,000 could be maintained by our resources of crop, pasture, and forest land.

Our forage resources, C. V. PIPER, H. N. VINALL, R. A. OAKLEY, L. CARRIER, O. E. BAKER, J. S. COTTON, O. A. JUVE, N. P. BRADSHAW, E. W. SHEETS, C. D. MARSH, W. C. BARNES, and W. B. BELL (*U. S. Dept. Agr. Yearbook 1923, pp. 311–414, figs. 80*).—Statistics, maps, and graphs set forth the proportions of the total crop acreage used to produce forage, food, and other products; the relative values of these different classes of crop products; the development of forage production; and the relations between livestock and human population. The forage production in the different agricultural regions, including the Corn Belt, the hay and dairy region, the corn and winter wheat region, the Cotton Belt, the coastal strip, the Great Plains, the Rocky Mountain region, the arid interior plateau, and the south Pacific regions, is similarly presented. Statistics of production of important kinds of harvested forage are given. The principal forage-producing crops of corn, oats, alfalfa, clovers, timothy, wheat, wild or native hay, sorghums, barley, miscellaneous tame hays, cotton, rye, sugar beets, flax, mixed grain, and annual legumes are described. The principal pasture regions of the United States are designated as the northern and southern humid regions, the western range, and the Pacific humid region. The grazing season and carrying capacity of these regions are discussed. Methods of improving the western range lands are suggested, and certain control measures are advocated.

In presenting the economic importance of farm pastures, a preliminary report is made upon studies by the Department cooperating with the agricultural colleges in the several States intended to determine as accurately as possible the relation of pasture costs to pasture rentals. Returns for 182 farms in 10 districts in 1922 are tabulated. The values per acre of land in pasture, which include fence investment, vary from $34 for the Montana district to $139 for Cottonwood County, Minn. In the Wisconsin district the permanent pasture is valued at a little less than half that of crop land. Rotation pastures range in value from $113 in the South Dakota district to $160 in Cottonwood County, Minn. In none of the districts studied did the rental of the pastures equal the cost when interest is included on the appraised land values. In only two districts, Gallatin County, Mont., and Medina County, Ohio, was the rental sufficient to cover interest charges at current rates on the capital invested. Nevertheless, in most of these areas the return on land investments after all other costs had been deducted compared favorably with the usual returns on land devoted to crops.

Data from studies on the requirements for and the cost of production of market milk and records from Corn Belt farms producing beef cattle are summarized to indicate the economic importance of pasture on dairy and beef cattle farms.

Farm ownership and tenancy, L. C. GRAY, C. L. STEWART, H. A. TURNER, J. T. SANDERS, and W. J. SPILLMAN (*U. S. Dept. Agr. Yearbook 1923, pp. 507–600, figs. 77*).—These pages constitute a review of the present extent and relative importance of the different classes of land tenure. They set forth their geographical distribution and trace briefly recent trends with reference to landownership and tenancy as shown by census and farm survey statistics. The causes of the development of tenant farming are considered from the two points of view of the conditions that cause land to be owned by landlords and those that cause persons to become tenants. Other phases of the problem which are set forth are the relation of types of tenure to efficiency in farm operations and the interrelation of the form of tenure with progress in accumulation, education, and the standard of living. The principal kinds of contracts between landlords and tenants are described. The extent, the reasons for, and social and economic consequences of the shifting of farm operators from farm to farm are also set forth. The need for the development of a positive and constructive policy with resect to land tenure in the United States is emphasized.

Increasing farm earnings by the use of simple farm accounts, H. C. M. CASE and M. L. MOSHER (*Illinois Sta. Bul. 252 (1924), pp. 147–182, figs. 8*).—During the spring of 1916 the University of Illinois and the Woodford County Farm Bureau cooperated in helping about 60 Woodford County farmers start accounts of their farm business. During the succeeding years farm records were kept by varying numbers of farmers, 19 having been continued through seven successive years. These records are analyzed in these pages as showing the benefits which these 19 farmers realized from the continuous study and improvement of the organization and operation of their farms and the importance of certain factors affecting the efficiency of the farm business. The records used are simple financial accounts, including inventories of the farm business taken at the beginning and end of the year and a record of receipts and expenses, together with a record of the amount of products raised on the farm during the year.

The 7 best paying of the 19 farms made as a yearly average 4.52 per cent more on the investment than the 7 poorest paying ones, or paid the operator $2,153 more for his labor and management. Five farms that were better than the average in 4 of the 5 factors discussed earned 9.31 per cent on the investment; 3 farms above the average in only 3 factors earned 6.63 per cent on the investment; 6 farms above the average in 2 factors earned 5.79 per cent on the investment; while 5 above the average in 1 factor or in no factor earned only 4.08 per cent, or lacked $65 of paying anything for the labor and management of the operator. Summaries of these farm records are tabulated.

Farm motor trucks in New York, V. B. HART (*New York Cornell Sta. Bul. 427 (1924), pp. 3–56, figs. 4*).—For the purpose of obtaining reliable data on the costs of operating farm trucks and information as to the possibilities and limitations of trucks for farm use, questionnaires were first sent out to all farm bureau committeemen in New York State asking for the names and addresses of farm truck owners. Questionnaires asking for information on more than 100 points pertaining to farm trucks and their relation and effect on farm organization were then sent to truck owners, and 562 farmers representing all of the agricultural regions of the State made returns. Of these 251 were complete. Personal visits were made also to 103 farmers who owned trucks in the dairy sections of Chenango, Broome, and Delaware Counties, and records of the cost of operating were obtained, together with data similar to those asked for in the questionnaire.

The 247 farms, for which the various crops grown and the number of livestock kept were reported, were 43 per cent larger than the average as given by the Fourteenth United States Census and had 81 per cent more acres of crops than the average farm. They also had 1.2 more work animals than the State average and 13.7 cows as compared with the average of 7.8. On the basis of the amount of productive work represented by the crops and the stock handled, these farmers had businesses 100 per cent larger than the average.

Of the 562 men who returned questionnaires, 556 had only 1 truck, 3 had 2, and 3 had 3. Of these trucks, 44 per cent were of the 1-ton size and 26 per cent were ½-ton trucks. Less than 4 per cent of these men were using trucks larger than the 2-ton size. Approximately one-third of the owners were less than 5 miles from the market, one-third from 5 to 10 miles, and the remainder 11 miles or more. Of the 355 men who had owned trucks for one year or more and who reported as to whether or not they had changed their markets, 289 stated that they had not done so and 66 stated that they had. The introduction of trucks into the dairy section from which survey records were obtained seems to have extended the market milk territory farther back into the hill country.

The average annual cost of operating a truck exclusive of cost of driver was $395.04, depreciation and fuel each making up about 27 per cent of the total annual cost and cash repairs about 24 per cent. Other costs in the order of size were interest, lubrication, license, use of buildings, and insurance. The sum of depreciation and repairs on the 41 trucks bought new was $231.47, and for the average of the secondhand ones it was $169.84. The average cost per mile for the secondhand trucks was 8.3 cts. as compared with 11.8 cts. for the 41 bought new and having an average age of 2.53 years less than the trucks bought secondhand. The average number of days that the newer trucks were laid up for repairs was 1.4 as compared with 1.1 for the 29 secondhand machines.

The average cost per ton-mile of truck hauling without drivers was 16.2 cts., and the cost per ton-mile of horses and wagons without drivers 25.7 cts. Taking into consideration that the time required to do the hauling with horses was nearly three times as great, the cost per ton-mile of a driver for horses was 14.6 cts. as compared with 5.3 cts. for trucks.

United States grades for shelled White Spanish peanuts (*U. S. Dept. Agr., Dept. Circ. 304* (*1924*), *pp. 2*).—The Bureau of Agricultural Economics recommends four grades for shelled White Spanish peanuts and defines the grade terms as used.

The wheat situation, W. A. SCHOENFELD ET AL. (*U. S. Dept. Agr. Yearbook 1923, pp. 95–150, figs. 39*).—These pages embody substantially the report previously noted (E. S. R., 50, p. 389).

International yearbook of agricultural legislation (*Internatl. Inst. Agr.* [*Rome*], *Internatl. Yearbook Agr. Leg., 13* (*1923*), *pp. XLVI+1018*).—This is the first English edition of an annual report which was noted in French for the preceding year (E. S. R., 50, p. 393).

Rural life [studies by the Missouri station] (*Missouri Sta. Bul. 210* (*1924*), *pp. 61–64, fig. 1*).—The progress achieved in a number of investigations in the year ended June 30, 1923, is set forth briefly.

Utilization of labor on the farm, O. R. Johnson.—Tables are drawn up showing the effect of the size of fields on the utilization of labor and the percentage of saving in labor and cost on fields of different sizes in growing corn. These summarize data covering 3,600 acres of corn from 1915 to 1919, inclusive. Man and horse hours required and the cost of both man and horse labor per acre are seen to decrease as the fields increase from 5 acres or less to over 25 acres. The percentage of saving in labor and cost increases steadily through the same size groups.

Beef cattle production in Missouri, B. H. Frame, R. S. Springgate, and O. E. Palmer.—A combined financial statement of 30 beef cattle herds in Pettis and Saline Counties for 1921–22 is presented.

Cost of producing farm products under farm conditions, B. H. Frame.—It is stated that from production factors obtained from 22 farm records since this project was started the costs of producing the 1922 crops of wheat, oats, and corn in Missouri were $1.37, 66 cts., and 68 cts. per bushel, respectively.

Rural training laboratory; a study of the rural primary groups of Boone County, Missouri, E. L. Morgan.—From a house to house census made to determine the primary allegiance of all families whose neighborhood choice was in question, a determination was made of the contribution to group consciousness of the various factors. The school was rated as high and farm organization low as a determinant.

Cost of family living on the farm, O. R. Johnson.—Information with respect to the cost of living on 28 farms is summarized. Certain percentages of the total are groceries 16.32, the use of the house 18.38, the products used in the home 16.38, dry goods and clothing 12.76, educational 2.79, travel, amusement, and recreation 7.28, and hired labor 3.7.

The standard of living on the farm as a factor in cost of production, O. R. Johnson.—The farm price index, the money spent for family living, and the cost of producing wheat and corn per bushel are tabulated for 28 farms for the years 1914 to 1923, inclusive, the average for the period 1910–1914 being taken as the base.

The agricultural and market value of Missouri farm lands, O. R. Johnson.—A graph is presented showing the trends of average farm land values from 1820 up to 1921 in seven counties by two-year periods.

A comparatively gradual increase from about $2.75 to $21 is noted between 1820 and 1901. Between 1901 and 1920 a rapid rise to about $54 is exhibited.

[Yearbook statistics of crops, livestock production, and trade, and temperature and precipitation], J. A. Becker, L. B. Flohr, G. B. L. Arner, W. F. Callander, and O. A. Juve (*U. S. Dept. Agr. Yearbook 1923, pp. 601–1222*).—As noted for the earlier year (E. S. R., 49, p. 391), current statistics and summaries for the United States are presented for specific crops and their products; farm animals and their products; forestry and forest products; imports and exports of agricultural products; and miscellaneous agricultural statistics, including meteorological data for selected points in the United States, 1912–1923.

Crops and Markets, [July, 1924] (*U. S. Dept. Agr. Crops and Markets, 2 (1924), Nos. 1, pp. 16; 2, pp. 17–32; 3, pp. 33–48, fig. 1; 4, pp. 49–64*).—The usual digests of current market reports are given setting forth the situation for each week of the market for the principal classes of agricultural products, including livestock, meats, and wool; fruits and vegetables; dairy and poultry; grain; hay; feed; and cotton. The receipts and the prices of specific commodities at important markets are given, as well as notes on foreign market conditions.

Monthly Supplement to Crops and Markets, [July, 1924] (*U. S. Dept. Agr., Crops and Markets, 1 (1924), Sup. 7, pp. 209–248, figs. 4*).—Current and comparative estimates of acreage, condition, production, and yields; crop conditions on July 1, 1924, by States; farm prices; the receipts and disposition of livestock at public stockyards for June; shipments of fruits and vegetables; and grain receipts are tabulated. Special articles offer estimates on the current condition of certain crops and the number of spring pigs, and note various phases of the production and marketing of livestock and livestock products, vegetables, and seeds. A report is made on a survey by the Department reaching over 16,000 representative farm owner operators in the United States, in which their replies to an inquiry are summarized. A return of $1,020 for the use of $17,500 worth of capital and the labor of the farmer and his family is the average determined for 1923. This is compared with an average return of $917 for 1922 from reports by 6,000 owner operators.

AGRICULTURAL EDUCATION.

The higher agricultural education of the future, E. Marchal (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 1 (1923), No. 2, pp. 265–271; also Natl. Research Council, Reprint and Circ. Ser., No. 51 (1923), pp. 6*).—A criticism is submitted of the two opposing views of the purposes of higher agricultural education, and the author of this paper declares himself to be of the opinion that agricultural education can best serve the special interests of agricultural science and the general interests of society not only by training students who will disseminate the knowledge of the progress already obtained but also, and more especially, by preparing pioneers, research workers, and molders of future agricultural progress. It is held that the agricultural college courses should develop still further along scientific lines and definitely take their place among the recognized higher university studies.

Agricultural education and research [in Scotland] (*Scot. Bd. Agr. Rpts., 11 (1922), pp. 20–38; 12 (1923), pp. 22–39*).—Reports are made practically as previously noted (E. S. R., 48, p. 192), covering the progress of the later years.

Federal Board for Vocational Education Yearbook, 1923, J. C. WRIGHT (*Fed. Bd. Vocat. Ed. Yearbook 1923, pp. XIII+443, pls. 2, figs. 27*).—This yearbook constitutes a general description of outstanding developments and a summary of progress by States intended to furnish more adequate information than was possible in the annual reports as noted for the preceding year (E. S. R., 48, p. 692). Pages 43–161 and 295–371 deal with the progress of and development in the vocational teaching of agriculture and home economics. Statistics are given, together with notes summarizing the reports of the States. Short reviews of vocational education in both agriculture and home economics in foreign countries are also presented.

Home demonstration work, 1922, G. E. FRYSINGER (*U. S. Dept. Agr., Dept. Circ. 314 (1924), pp. 44, figs. 8*).—The reports on home demonstration work from the States in 1922 are reviewed in these pages, constituting a report on methods and results. Progress in the type of supervision given from the State office to the county workers is noted. The number of counties undertaking some form of nutrition work increased greatly, while the clothing project continued as the leading one in 1922. Work with negro women and girls and urban home demonstration work are briefly noted.

The organization and direction of clothing clubs, H. M. PHILLIPS, F. MALLORY, and M. HAUGH (*Illinois Sta. Circ. 280 (1924), pp. 3–43, figs. 6*).—This circular is intended for the local leaders of clothing clubs, and contains detailed information for organizing club groups and directing the members in the actual work of the project.

Methods and results of cooperative extension work reported through county agricultural agents, 1922, H. W. HOCHBAUM (*U. S. Dept. Agr., Dept. Circ. 316 (1924), pp. 40, figs. 10*).—This progress report emphasizes the development of program making in accordance with the needs of the community. The means and methods of teaching by demonstrations, demonstration meetings, tours, general meetings, motion pictures, campaigns, and charts and exhibits, as well as the work of local project leaders, are described. Some tables are drawn up showing results.

Boys' and girls' club work, 1922, I. L. HOBSON and G. L. WARREN (*U. S. Dept. Agr., Dept. Circ. 312 (1924), pp. 52, figs. 10*).—Reports for 1922 show a general increase in the membership of farm boys and girls in extension work throughout the country. Of the club demonstrators enrolled for the year, 59 per cent completed the work and reported their results, this being an increase over that of any preceding year considered on the basis of the total enrollment in clubs throughout the United States. There were reported 28,194 organized clubs, of which 8,072 were standard. The results of the year exceeded those of any year since the war. An account of the methods which seemed to be most effective in 1922 is presented under the four main heads of determining the problems to be attacked, planning demonstrations that will show a remedy, carrying out the demonstrations, and establishing on a majority of the farms the practices demonstrated. It is held that probably no single factor in the extension work with boys and girls shows more marked improvement than State supervision.

Judging livestock, F. W. FITCH ET AL. (*Ga. Agr. Col. Bul. 298 (1924), pp. 32, figs. 19*).—This manual for club members presents some of the more important points in the art of judging livestock, together with score cards.

Livestock judging, R. E. HUNT ET AL. (*Va. Agr. Col. Ext. Bul. 83 (1923), pp. 64, figs. 26*).—Discussions of the principles of judging draft horses, beef cattle, dairy cattle, hogs, and mutton type sheep have been prepared by members of the animal husbandry and dairy husbandry departments of the Virginia Polytechnic Institute for the use of club members.

The wear of hosiery, L. STANLEY and A. E. FILLER (*Missouri Sta. Bul. 210 (1924), pp. 58, 59*).—The wearing qualities of stockings of cotton lisle, virgin wool, combined wool and silk, and several weights of silk, as well as of fiber silk, are briefly compared. Their care and selection with reference to size are suggested.

MISCELLANEOUS.

Agriculture Yearbook, 1923, H. C. WALLACE ET AL. (*U. S. Dept. Agr. Yearbook 1923, pp. V+1284, figs. 409*).—This contains the report of the Secretary of Agriculture, six special articles abstracted elsewhere in this issue, and the usual statistics, noted on page 795.

Report of the Hawaii Agricultural Experiment Station, 1922, J. M. WESTGATE ET AL. (*Hawaii Sta. Rpt. 1922, pp. 23, pls. 9*).—This contains the organization list, a summary by the agronomist in charge as to the work of the year, and reports of the divisions of horticulture, agronomy, and chemistry, home demonstration activities, the extension and demonstration work on the Island of Hawaii, and of the Haiku and Haleakala Substations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of the Hawaii Agricultural Experiment Station, 1923, J. M. WESTGATE ET AL. (*Hawaii Sta. Rpt. 1923, pp. 16, pls. 2*).—Data corresponding to the above for the year ended June 30, 1923, are reported, the experimental work recorded being for the most part abstracted elsewhere in this issue.

Report of Moses Fell Annex, Bedford, Indiana, June, 1924, H. J. REED and E. W. MOORE (*Indiana Sta. Circ. 117 (1924), pp. 20, figs. 15*).—The developments of the year are briefly reported, the experimental work recorded being for the most part abstracted on pages 724 and 747 of this issue. Brief notes are also given on variety tests with corn, soy beans, oats, and wheat.

Thirty-first Annual Report of [Minnesota Station], 1923, W. C. COFFEY (*Minnesota Sta. Rpt. 1923, pp. 31*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1923, and a report by the director dealing with changes in staff, publications, and the classification of the station projects.

Contributions to knowledge in agriculture: One year's work [at the Missouri Station], July 1, 1922, to June 30, 1923, F. B. MUMFORD ET AL. (*Missouri Sta. Bul. 210 (1924), pp. 77, figs. 21*).—This contains the organization list, a report by the director on the work and publications of the station, and a financial statement for the Federal funds for the year ended June 30, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report of [Rhode Island Station, 1923], B. L. HARTWELL (*Rhode Island Sta. Rpt. 1923, pp. 12*).—This report includes experimental work for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Ohio Agricultural Experiment Station [March–April, 1924] (*Ohio Sta. Mo. Bul., 9 (1924), No. 3–4, pp. 33–72, figs. 7*).—This number contains five articles abstracted elsewhere in this issue.

NOTES.

Iowa College and Station.—The departments of agricultural engineering, home economics, engineering extension, agricultural economics, and electrical engineering are cooperating in a study of farm electrification which is being made at Garner. The main object of the study is to ascertain the relative cost and value of the use of electricity for various farm and home operations as compared with other forms of farm power.

Minnesota University and Station.—A tract of about 40 acres which has been used for experimental work for many years has been purchased by the university at a cost reported to be about $700 per acre. It is expected that the land will continue to be used by the station.

Missouri Fruit Station.—A 350-ft. well has just been completed at the station farm, giving a flow of water of 22.5 gal. per minute. This will furnish a supply for spraying the experimental orchards and vineyards and for the experimental work in the irrigation of fruits and vegetables.

C. M. Williams has been reappointed to the staff as extension horticulturist.

Nebraska University.—Earl M. Cline and John R. Webster have been elected regents of the university, the former vice Frank W. Judson. F. J. Taylor has been appointed regent to fill a vacancy occasioned by the resignation of W. L. Bates.

North Carolina College.—A new animal husbandry building to cost, with equipment, over $200,000 has been authorized.

American Society of Agronomy.—The seventeenth annual meeting of this society was held at Washington, D. C., November 10 and 11, 1924.

The president's address was given by M. F. Miller of the University of Missouri on Agronomic Science and Increased Production. Professor Miller called attention to the fact that with practically all of the fertile lands of the United States in use the agronomist must aid in enlarging acre yields to provide for the growing population. Although restricted immigration and lowered birth rate of the native stock may check the rapidity of increase, he believed that the maximum population may be attained about 2000 A. D., if this time is not deferred because of enhanced food production. To supply the increased population with food and yet maintain the standard of living will require that this country curtail the exportation of certain foods and import others. He pointed out that while the white race is restricted to regions with favorable climates and food production, it can use foodstuffs produced by natives of other regions.

To provide for the estimated 200,000,000 people will make necessary further increase in yields and extension in areas. Twenty-five per cent is said to be the maximum possible expansion in acreage, but better methods may raise production by one-third. This will require better cultivation, more skillful use of machinery and fertilizers, greater efforts, and the application of agronomic science. Factors tending to impede greater production per acre include the higher costs of increased acre yields, maintenance of soil fertility, pest control, regional conditions, land tenure problems, and the capital and personal limitations of the farmer. Citing legislation for experimental and extension activities, cooperative organizations, and the Federal farm loan act, Professor Miller said that the United States had been unique in its efforts to aid agriculture.

In helping the farmer meet the difficulties in increasing production the agronomist will have an important part. It was prophesied that the demands upon him will become more exacting with the passage of time.

The program was again arranged to include a number of symposia. The first general symposium dealt with the economic relationships of agronomy, and was led by E. G. Montgomery of the Department of Commerce. Papers were presented on Diminishing Returns in the Application of Agronomic Science to Field Practice, by W. J. Spillman; The Economics of Fertilizer Use in the United States, by S. B. Haskell; The Economics of Liming, by J. A. Slipher; The Economic Interpretation of the Results of Fertility Experiments, by E. L. Worthen; and Changes in Standards of Living to Counterbalance Increasing Population, by E. G. Montgomery.

Agronomic Observations in Foreign Lands was the subject of the second general symposium. Varieties of Indian Corn in South America were described by F. D. Richey, and The Great Soil Groups of Brazil and Argentina and Their Possible Agronomic Values was discussed by C. F. Marbut. H. V. Harlan recounted his experiences in The Collecting of Cereal Varieties in Africa and Asia, and L. B. Kulkarni of the College of Agriculture, Poona, India, discussed The Ecology of the Grassland of the Bombay Deccan.

In the soils sectional program, a symposium which dealt with soil colloids was led by E. Truog, and included papers on The Chemical Nature of Soil Colloids, by R. Bradfield; The Colloidal Content of Soils, by P. L. Gile; The Colloidal Determination in Mechanical Analysis, by R. O. E. Davis; The Significance of Soil Colloids, Especially in Relation to Plant Feeding, and Leaching and Fixation of Essential Elements, by E. Truog; The Effect of the Colloidal Content on the Physical Properties of Soils, by G. Bouyoucos; and Climatic Agencies in Relation to Soil Colloids, by R. M. Salter. Thorough discussion followed most of the topics presented in this group.

The symposium on nitrogen fixation was led by K. F. Kellerman, and embraced the following papers: Chemical Nitrogen Fixation, by F. G. Cottrell; Bacterial Nitrogen Fixation, by F. Löhnis; Nitrogen Fixation Under Field Conditions, by J. G. Lipman; Soil Inoculation with Azotobacter, by P. E. Brown; and Recent Results of Inoculation, Especially with Garden Peas for Canning, by A. L. Whiting.

A symposium in the field crops section, dealing with the legume problem and led by H. R. Sumner, was so arranged as to be of particular interest to extension specialists. It was opened by a paper on The Economics of Increased Legume Production, by R. A. Oakley. The Utilization of Legumes in the Rotation was described with reference to conditions in the East, by J. H. Barron; in the Middle West, by R. Kenney; in the Northern Great Plains, by A. J. Ogaard; and in the South, by M. J. Funchess. Other papers in this group were presented by E. E. Barnes on The Function of Annual Legumes; H. D. Hughes on The Future of Sweet Clover in the Corn Belt; O. S. Fisher on The Relation of the Legume Project to Other Extension Projects in the Extension Program; and by P. F. Schowengerdt and C. E. Carter on A State Wide Campaign for More Legumes.

A plant physiology and agronomic science symposium, led by W. L. Burlison, embraced papers on Why Agronomy Needs Research in Plant Physiology, by C. R. Ball; The Desirability of a Knowledge of the Storage and Utilization of Organic Reserves in Crop Production, by E. J. Kraus; The Relation of Plant Physiology and Chemistry to the Study of Disease Resistance in Plants, by J. G. Dickson; What Contributions of Plant Physiology Will Most Benefit the Agronomist, by C. F. Hottes; Points of Agronomic Interest in the Physiology of Germination, by W. Crocker; Soil Moisture in Relation to the Growth of

Crop Plants, by H. L. Shantz; and Hydrogen-ion Concentration of the Soil Moisture with Reference to Plant Growth, by L. Knudson.

The usual reports were received from the editor, the secretary-treasurer, the advisory committee on agronomy to the National Research Council and from the joint committee with phytopathologists on terminology of fungi, and the committees on terminology, varietal standardization, standardization of field experiments, intercollegiate crop contests, and teaching of field crops. The constitution was amended to provide for four classes of membership, regular, associate, honorary, and fellows. The American Association of Soil Survey Workers and Western Canadian Society of Agronomy were invited to affiliate with the society.

Officers were elected as follows: President, C. W. Warburton; vice presidents, A. G. McCall, W. L. Burlison, M. J. Funchess, and E. F. Gaines; members of the advisory committee of the National Research Council, C. V. Piper and R. A. Oakley; and representatives with the American Association for the Advancement of Science, L. E. Call and E. Truog.

Association of Land-Grant Colleges.—The thirty-eighth annual convention of this association was held at Washington, D. C., November 12–14, 1924. The complete list of general officers elected is as follows: President A. F. Woods of Maryland, vice-president H. A. Morgan of Tennessee, secretary-treasurer J. L. Hills of Vermont, and members of the executive committee, the president ex officio (chairman), W. B. Bizzell of Texas, R. D. Hetzel of New Hampshire, J. G. Lipman of New Jersey, F. B. Mumford of Missouri, and R. A. Pearson of Iowa.

For the various sections the officers are as follows: Agriculture, F. W. Peck of Minnesota, chairman; D. T. Gray of Arkansas, vice-chairman; and E. C. Johnson of Washington, secretary; engineering, E. A. Hitchcock of Ohio, chairman, and R. A. Seaton of Kansas, secretary; and home economics, Edith P. Chace of Pennsylvania, chairman, and Margaret M. Justin of Knsas, secretary. In the three subdivisions of the section on agriculture, E. M. Freeman of Minnesota and C. H. Winkler of Texas were chosen chairman and secretary, respectively, for that of resident teaching; H. W. Mumford of Illinois and D. T. Gray of Arkansas for experiment station work (with E. W. Allen as recording secretary); and H. J. C. Umberger of Kansas and I. O. Schaub of North Carolina for extension work.

In the standing committees, C. T. Dowell of Oklahoma and Abby L. Marlatt of Wisconsin succeeded T. D. Boyd of Louisiana and Nellie Crooks of Tennessee on the committee on instruction in agriculture, home economics, and mechanic arts. In the committee on college organization and policy, Martha Van Rensselaer of New York replaced Louise Stanley of this Department for one year, and E. C. Elliott of Indiana succeeded R. D. Hetzel of New Hampshire for three years. J. T. Jardine of Oregon was appointed to the committee on experiment station organization and policy, and F. W. Peck of Minnesota and J. P. Campbell of Georgia to the committee on extension organization and policy succeeding, respectively, B. Youngblood of Texas, B. H. Crocheron of California, and T. B. Symons of Maryland. C. C. Little was succeeded on the committee on military organization and policy by A. G. Crane of Wyoming, and A. Marston of Iowa on the committee on engineering experiment stations by C. R. Jones of West Virginia. S. B. Haskell of Massachusetts replaced G. R. Lyman of West Virginia on the joint committee on publication of research. The remaining committee members whose terms had expired were reappointed.

EXPERIMENT STATION RECORD.

VOL. 51. DECEMBER ABSTRACT NUMBER. No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Handbook of biological methods.—I, Chemical methods.—III, General analytical methods, edited by E. ABDERHALDEN (*Handbuch der Biologischen Arbeitsmethoden. Abt. I, Chemische Methoden. Teil III, Allgemeine Analytische Methoden. Berlin: Urban & Schwarzenberg, 1921, pt. 3, Nos. 1, pp. 1–324, figs. 126; 2, pp. 325–508, figs. 87; 3, pp. 509–656, figs. 28; 4, pp. 657–844, pls. 2, figs. 22; 5, pp. 845–931+XXV, figs. 27*).—This handbook consists of the following sections: The Most Important Stoichiometrical Calculations, by J. Biehringer; Methods of Microchemistry, by F. Emich; Microelementary Analysis According to Fritz Pregl (Determination of C, H, N, Cl, Br, I, S, P, As, and metals), by H. Lieb; Half-microelementary Analysis, by J. V. Dubsky; Nitrogen Determination by the Kjeldahl Method (Macro and Micro Methods), by A. Fodor; Organic Elementary Analysis, by H. Simonis; Simplified Elementary Analysis, by M. Dennstedt; Method for the Determination of Nitrate and Nitrite Nitrogen, by A. Oelsner; Methoxyl and Methylimid Determination, by J. Herzig; Micromethoxyl Methylimid Determination, by H. Lieb; Gravimetric Micromethoxyl Determination, by F. Wohack; Qualitative and Quantitative Determination of the Acetyl Groups, by H. Simonis; Gravimetric Analysis, by J. Biehringer; Ash Analysis, by G. Lockemann; The Most Important Electrochemical Methods, by K. Arndt; Quantitative Determination of Precipitates by the Microvolumetric Method, by H. J. Hamburger; Microelectrolytic Determination of Copper, by H. Lieb; Work with the Macrobalance, by K. Scheel; Work with the Automatic Registering Balances for Gain and Loss in Weight, by E. Abderhalden; A Gravimetric Method for the Determination of Small Amounts of Phosphorus, by G. Embden; and A Supplement to the Article "Methoxyl and Methylimid Determination," by J. Herzig.

Handbook of biological methods.—I, Chemical methods.—V, Carbohydrates, edited by E. ABDERHALDEN (*Handbuch der Biologischen Arbeitsmethoden. Abt. I, Chemische Methoden. Teil V, Kohlenhydrate. Berlin: Urban & Schwarzenberg, 1922, pt. 5, Nos. 1, pp. 1–400, figs. 12; 2, pp. 401–784; 3, pp. 785–1101+XXIV*).—This handbook, by G. Zemplén, deals chiefly with general and special methods for the qualitative detection and quantitative determination of carbohydrates from synthesis and analysis. A final chaper on glucuronic acids and their derivatives is contributed by F. F. Nord.

Handbook of biological methods.—I, Chemical methods.—VII, Protein decomposition products and related compounds, edited by E. ABDERHALDEN (*Handbuch der Biologischen Arbeitsmethoden. Abt. I, Chemische Methoden. Teil VII, Eiweisszabbauprodukte und Verwandte Verbindungen. Berlin: Urban*

& Schwarzenberg, 1922, pt. 7, Nos. 1, pp. 1–262, figs. 13; 2, pp. 263–778, figs. 5; 1923, pt. 7, No. 3, pp. 779–931+XX, fig. 1).—The subjects and authors included in this number of the series of handbooks on chemical methods are as follows: General Technique and Isolation of Monamino Acids, by E. Abderhalden; Special Methods for the Detection of the Individual Amino Acids, by A. Weil; The Analysis of Proteins Through the Determination of the Characteristic Chemical Groups of the Various Amino Acids, by D. D. Van Slyke; Isolation of the Amino Acids Asparagin and Glutaminic Acid from Plants, by E. Winterstein; Detection, Determination, and Synthesis of the Monamino Acids, by A. Fodor; Methods for the Biological Splitting of Racemic Amino Acids by Living Organisms, by F. Ehrlich; Isolation, Determination, and Detection of Histidin, Lysin, and Arginin (Ornithin and Guanidin) and Synthesis and Analysis of the Hexone Bases, by H. Steudel; Formol Titration, by H. Jessen-Hansen; The Volumetric Determination of Primary Aliphatic Amino Nitrogen and Its Application to Physiological-Chemical Processes, by D. D. Van Slyke; The Alkalimetric Determination of Amino Acids and Polypeptids, by R. Willstätter; Biogenous Amins (Ptomains, Extractives, and Urinary Bases), by M. Guggenheim; Detection, Preparation, and Determination of Methylated Amino Acids and Betains in Animal and Plant Tissues, by G. Trier; Preparation of Some Biochemically Active Substances from Molasses and Molasses Spent Liquor, by F. Ehrlich; Biologically Active Amino Acids Not Present in Proteins, by E. B. H. Waser; Biochemically Active Substances Isolated from Tryptophan, by A. Ellinger; Isolation of Peptones and of Kyrin, by R. Zimmermann; Isolation of Polypeptids and Their Decomposition Products from Proteins and Methods for the Synthesis of Polypeptids, by E. Abderhalden; Creatin and Creatinin, by O. Riesser; Preparation of a Cystein- and Glutaminic Acid-Containing Compound from Yeast and Organs According to F. G. Hopkins, by E. Wertheimer; and The Detection, Determination, and Synthesis of *l*-Oxyprolin, by A. Fodor.

Handbook of biological methods.—I, Chemical methods.—VIII, Albuminous substances (proteids and proteins), edited by E. Abderhalden (*Handbuch der Biologischen Arbeitsmethoden. Abt. I, Chemische Methoden. Teil VIII, Eiweiszstoffe (Proteide und Proteine). Berlin: Urban & Schwarzenberg, 1920, pt. 8, No. 1, pp. 1–184; 1921, pt. 8, Nos. 2, pp. 185–350, figs. 6; 3, pp. 351–576, figs. 7; 1922, pt. 8, No. 4, pp. 577–800+XXVI, figs. 22*).—The subjects and authors of the various sections of this handbook are as follows: Nucleoproteids, by F. Samuely, revised by H. Steudel; Preparation and Detection of the Nucleic Acids, Complete Analysis of Nucleic Acids, and Detection and Preparation of Their Components, Analyses of the Nucleic Acids, and Partial Analysis and Isolation of Their Constituents, by Thannhauser; Isolation of Purin Bases and Alloxuric Bodies from Plants, by E. Winterstein; Nucleic Acids, Nucleosids, and Simple Nucleotids, by Thannhauser; Preparation of Blood Pigments, by F. N. Schulz; Iron-Containing Components of the Blood Pigments, Their Detection and Derivatives, Studies on Porphyrin, The Analysis of Hematin and Porphyrin, and the Synthesis of Their Cleavage Products, Synthetic Polynuclear Pyrrol Derivatives and the Constitution of Hemin, and Bile Pigments and Cleavage Products of Bilirubin, by W. Küster; Detection and Determination of Porphyrin in Blood Serum, Liver, Kidneys, and Other Organs and in Bones, and the Formation, Occurrence, and Determination of Blood Serum, by O. Schumm; Preparation of Plant Proteins, by T. B. Osborne and E. Strauss; Preparation of Animal Proteins, Including Crystallized Proteins, by F. N. Schulz; True Proteins, by F. Samuely and E. Strauss; Proteinoids, by E. Strauss; Histones and Protamins, by H. Steudel; Work with Organic Proteins, by J. Pohl; The Preparation and Investigation of a Well-Defined Protein, by H. Jessen-Hansen; Transformation Products of Proteins, by E. Strauss; Methods for the Removal of Proteins from Protein-Containing Fluids, by P. Rona, completed by E. Strauss; and Animal Pigments and Colors, by F. Samuely, revised by E. Strauss.

Handbook of biological methods.—I, Chemical methods.—IX, Special chemical methods, edited by E. ABDERHALDEN (*Handbuch der Biologischen Arbeitsmethöden. Abt. I, Chemische Methoden. Teil IX, Spezielle Chemische Methoden. Berlin: Urban & Schwarzenberg, 1920, pt. 9, pp. XV+636, figs. 15*).—In this handbook, the section on The Detection of Alkaloids is contributed by V. Grafe and that on the Structure, Analysis, and Synthesis of Alkaloids by J. Schmidt.

The physico-chemical properties of strong and weak flours.—VII, The physical state of the gluten as influencing the loaf volume, P. F. SHARP, R. A. GORTNER, and A. H. JOHNSON (*Jour. Phys. Chem., 27 (1923), No. 9, pp. 942–947*).—In this continuation of the investigation previously noted (E. S. R., 50, p. 503), two series of baking tests are reported which afford further proof that flour strength is dependent upon the quality or the colloidal properties of the glutenin.

In the first series, doughs made of patent flour of known quality were brought to H-ion concentrations of pH 3 and pH 11 and kept at these concentrations for 30 minutes, after which they were brought back to the original H-ion concentration. The other ingredients were then added and the dough baked and compared with control loaves prepared from the same flour without alteration of the H-ion concentration. The prepared doughs were short and broke like putty when pulled, and the bread baked from them was of coarse texture and did not brown in the oven.

In the second series, doughs were prepared with 70 per cent, and in two cases 95 per cent, ethyl alcohol. The alcohol was then evaporated from the dough by a current of air from an electric fan and the resulting material used in baking tests. In this experiment patent, durum, and rye flour were compared. The doughs made from the first two flours were hard to handle and broke in the kneading process. No difference could be detected in the case of rye flour between the control and alcohol-treated samples. The texture of the bread prepared from the alcohol-treated patent and durum flours was so poor that the baker was unable to give the loaves a numerical score.

Viscosity as a measure of hydration capacity of wheat flour and its relation to baking strength, P. F. SHARP and R. A. GORTNER (*Minnesota Sta. Tech. Bul. 19 (1923), pp. 5–119, figs. 14*).—This publication contains an extensive historical review of the more important factors which have been investigated as having a possible effect upon flour strength, followed by a detailed report of the authors' investigations on the subject which have been noted from other sources (see above). A list of over 250 references to the literature is appended.

Milling and baking qualities of wheat (*Nebraska Sta. Rpt. [1923], pp. 25, 26*).—In analyses of 9 or 10 samples of wheat showing widely different baking qualities, no correlation could be discovered between baking qualities and chemical properties, with the exception that higher baking qualities were apparently associated with higher percentages of water-soluble ash. A detailed study of the relation of the baking qualities of wheat flours to the viscosities of their acidified suspensions in water has led to the conclusion that for Nebraska wheats such relationship exists only within limited groups of samples grown under similar environmental conditions. A high baking quality was not always found to be associated with high viscosity in the acidified flour and water suspension.

[Baking tests with Indiana wheat flour] (*Indiana Sta. Rpt. 1923, pp. 33, 34, fig. 1*).—It is reported that flour made from wheat grown in various sections of Indiana has proved excellent for cake, light rolls, quick or hot breads, and pastry. In most cases less liquid is required for Indiana flour than for flour produced from harder varieties of wheat. Indiana wheat flour is thought to compare favorably in nutritive value with flour of the same grade produced from other wheats.

The theory of practical bread and flour manufacture, A. Fornet (*Die Theorie der Praktischen Brot- und Mehlbereitung. Berlin: F. A. Gunther & Son, 1923, 2. ed., rev. and enl., pp. 240, pl. 1, figs. 68*).—This is a manual on the chemistry of flour milling and baking. An ingenious table is appended, showing schematically the chemical changes taking place in the metabolism of carbohydrates, fats, and sugar and in the nutrition of yeast in bread dough.

Chemical investigation of the amylases and related enzymes, H. C. Sherman (*Carnegie Inst. Wash. Yearbook 22 (1923), pp. 296–298*).—The work outlined in this progress report (E. S. R., 48, p. 804) has been noted from the complete reports of the various phases of the investigation (E. S. R., 50, p. 611). The work to date points consistently to the protein nature of enzyms.

[The effect on cotton seed of sterilizing against the pink bollworm], A. P. Kerr et al. (*Louisiana Stas. Rpt. 1923, p. 32*).—Determinations of the free fatty acid content of cotton seed from the same ginning, both before and after sterilization, do not indicate that the free fatty acids are increased by the amount of heat required by the regulations for sterilizing cotton seed to kill the pink bollworm.

Testing decolorizing carbons, J. E. Teeple and P. Mahler (*Indus. and Engin. Chem., 16 (1924), No. 5, pp. 498–500, figs. 6*).—The author discusses the theoretical basis of the decolorizing action of carbons, and presents the results of experimental work on testing the decolorizing action by following with a Hess-Ives tint photometer the changes in any particular color unit, red, green, or blue violet, due to adsorption. Since the purpose of using decolorizing carbons is in general to remove the blue violet color unit, it is considered advisable in most cases to work solely with the blue violet screen.

A simple model of a microelectrode for H-ion concentration determinations [trans. title], G. Lehmann (*Biochem Ztschr., 139 (1923), No. 1–3, pp. 213–215, fig. 1*).—An apparatus for electrometric H-ion concentration determinations requiring only 1 drop of the solution to be tested is described and illustrated.

A drop of the liquid is placed on a tiny watch crystal mounted within a section of glass tubing 3 cc. long and 1.3 cm. in diameter. The connection with the calomel agar siphon is at the top and with the hydrogen apparatus at the bottom of this receptacle. The platinum electrode with mercury seal and the capillary end of the calomel tube touch the drop of solution, which has been sufficiently diluted with water. With the use of suitable buffers the method is said to check with the Michaelis macroelectrode to within 0.03 pH.

Determination of nitrogen in nonhomogeneous products [trans. title], E. Rousseaux (*Ann. Falsif., 17 (1924), No. 184–185, pp. 99–103*).—Attention is called to errors likely to arise in the determination of nitrogen in samples which can not be made sufficiently homogeneous. As a method of avoiding these errors, it is suggested that the sample be separated into two or three fractions by sifting and the determination conducted separately on each fraction, or that the whole sample be given a preliminary treatment with from 10 to 15 gm. of sulphuric acid.

A new colorimetric micromethod for the determination of phosphoric acid [trans. title], Y. Terada (*Biochem. Ztschr., 145 (1924), No. 5–6, pp. 426–*

430).—The method described depends upon the precipitation of the phosphoric acid with a molybdenum strychnin solution, the solution of the precipitate in sodium carbonate, and the reaction between the dissolved phosphate and phenylhydrazin hydrochlorid, with the formation of a wine-red color which can be compared quantitatively with suitable standards in a Duboscq colorimeter. The method, as described, is said to be suitable for concentrations of P_2O_5 of between 0.06 and 0.3 mg. and to have an experimental error of only about 0.5 per cent.

A method for the accurate determination of carbonic acid present as carbonate in soils, P. B. SANYAL (*Agr. Research Inst., Pusa, Bul. 151* (*1923*), *pp. 8, figs. 3*).—The method consists of decomposing the carbonates of the soil samples at ordinary temperature with excess dilute hydrochloric acid and constant stirring and the removal of the liberated carbon dioxid by a stream of hydrogen generated by the addition to the reacting mixture of aluminum and a few drops of copper sulphate solution. The apparatus for the determination, which contains an ingenious mercury-sealed stirring arrangement, is described and illustrated.

Investigations on the electrometrical methods of determining reactions of soils [trans. title], H. R. CHRISTENSEN and S. T. JENSEN (*Tidsskr. Planteavl, 29* (*1923*), *No. 5, pp. 783–816, figs. 4*).—A comparison of hydrogen and quinhydrone electrodes for determining the H-ion concentration of soils showed the latter to be in most cases as satisfactory as the former. An exception to this was a series of soils from a coffee plantation in Africa. The electrometric method was more reliable than the colorimetric, particularly in the case of neutral or alkaline reacting soils, which almost always gave too low results with the colorimetric method. This is thought to be due to the very slight buffer content of clear soil extracts. Suggestions are given for conducting the tests, and the results are reported of a comparison of Azotobacter development according to the Azotobacter test and the H-ion concentration as determined electrometrically with the quinhydrone electrode. These show that the optinum H-ion concentration for Azotobacter development is in the neighborhood of pH 6.

Available nitrogen in fertilizers.—Need of a new method for its determination, J. W. KELLOGG (*Indus. and Engin. Chem., 16* (*1924*), *No. 4, pp. 371, 372*).—Attention is called to the need of a new method of determining available nitrogen in fertilizers, the requisites of a satisfactory method are outlined and discussed, and a tentative method is recommended, the technique of which is given as follows:

"A 1-gm. sample of fertilizer is weighed out and transferred to a No. 40, 12.5-cm. Whatman filter paper and washed with distilled water (room temperature) until the filtrate amounts to 250 cc. The filter paper and residue are then transferred to a 300-cc. Pyrex beaker (tall form 76 by 114 mm.), 100 cc. of N/100 oxalic acid solution (room temperature) are added, and the whole is digested by heating to the boiling point and boiling continuously for 15 minutes. (Total heating and boiling should require approximately one-half hour.) Immediately after digestion is completed 50 cc. of cold distilled water are added, and the solution is decanted, filtered, and washed with cold water through a No. 40, 12.5-cm. Whatman filter paper until the filtrate from washings amounts to 250 cc. The filter paper and residue, which includes the insoluble or inactive nitrogen, are then transferred without drying to a Kjeldahl flask and the nitrogen determined (Gunning method preferred). The nitrogen thus obtained, deducted from the total nitrogen previously determined, is estimated as available nitrogen."

Data are reported on the results obtained with this method on a large number of samples of fertilizers of various kinds and on corresponding results obtained by the alkaline permanganate method.

The calculation of the fat content in the simplified fat determination with a fixed amount of solvent [trans. title], J. GROSSFELD (*Ztschr. Untersuch. Nahr. u. Genussmtl., 46 (1923), No. 2, pp. 63–73*).—The derivation is given of formulas to correct for differences in the concentration and specific gravity of fats in the method of fat determination previously noted (E. S. R., 50, p. 614).

Quantitative aspects of the Kreis test, II, G. E. HOLM and G. R. GREENBANK (*Indus. and Engin. Chem., 16 (1924), No. 5, p. 518*).—In a further study of the Kreis test (E. S. R., 50, p. 713), it has been shown that, contrary to the conclusion tentatively advanced in the previous paper, other unsaturated acids than oleic will give the reaction when they have absorbed oxygen.

The three unsaturated acids tested were linoleic, linolenic, and ricinoleic. Of these the proportion of color produced by linoleic and linolenic was less than that produced by oleic acid, but the color was of the same shade and was extracted in the hydrochloric acid layer. The type of color given by ricinoleic acid with the Kreis reagent was entirely different, the relative proportion of color was small, and the rate of oxygen absorption slow. Linoleic and ricinoleic acids gave faint tallowy odors and linolenic acid no odor on oxidation. This is thought to confirm the previous conclusion that "the olfactory sense gives no true criterion of how highly oxidized a fat or oil may be."

A new principle for the indirect determination of carbon dioxid and the respiratory quotient with a differential spirometer [trans. title], E. HELMREICH and R. WAGNER (*Biochem. Ztschr., 145 (1924), No. 1–2, pp. 77–81, fig. 1*).—An apparatus on the same principle as that of Krogh for recording oxygen consumption automatically (E. S. R., 48, p. 859) has been devised for recording carbon dioxid consumption. The apparatus is described and illustrated.

A method for estimating the retention of calcium and phosphorus in young growing rats, M. A. BOAS (*Biochem. Jour., 18 (1924), No. 2, pp. 425–432, figs. 3*).—A detailed description is given of the method employed by the author in determining calcium and phosphorus retention in young growing rats, and data are reported on its use in determining the rate of retention of these elements in normal rats. The curves plotted from the data resemble the curves of normal growth.

On the estimation of organic phosphorus, E. J. BAUMANN (*Jour. Biol. Chem., 59 (1924), No. 3, pp. 667–674*).—Evidence is presented that in the micromethod of Bloor (E. S. R., 40, p. 16) and in the method of Bell and Doisy (E. S. R., 44, p. 613) for determining phosphorus serious losses may occur in the wet ashing, due to the volatilization of phosphoric acid and the conversion of orthophosphoric to meta- and pyrophosphoric acids. Heating with from 20 to 30 per cent hydrogen peroxid and sulphuric acid was found to be a simple and efficient means of avoiding these errors. Procedures for the estimation of lipoid phosphorus of blood and tissues and of total or organic phosphorus embodying this method of oxidation are described.

The Bloor alcohol-ether extraction process is first used, followed by oxidation with sulphuric acid and hydrogen peroxid. The phosphorus is finally estimated by the colorimetric method of Bell and Doisy. The method as described is applicable to the estimation of as small an amount as 0.02 mg. of phosphorus with an error of from 2 to 5 per cent, the greatest source of error being in the extraction processes.

Wheat gluten [trans. title], J. GERUM and C. METZER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 46 (1923), No. 2, pp. 74–86*).—In continuation of the study of wheat gluten with particular reference to the detection of mixtures of rye and wheat flour (E. S. R., 48, p. 311), gluten from wheat flour of 0 to 20, 21 to 50, 50 to 70, and 70 to 85 per cent extraction, alone and in admixture with various amounts of rye flour, was analyzed for P_2O_5 and N_2.

It was found that with increase in percentage extraction there was an increase in the P_2O_5 content of the gluten and a decrease in the ratio P:N. In mixtures of wheat and rye flour, the amount of dried gluten was sometimes higher and sometimes lower than the results calculated on the basis of rye flour being an indifferent diluent. No differences were noted between rye of 55 and 85 per cent extraction. It is considered that the proteins in rye play a part in gluten formation in rye-wheat mixtures.

The investigation of sweet and sour milk [trans. title], J. Drost, M. Steffen, and E. Kollstede (*Milchw. Forsch., 1 (1923), No. 1, pp. 21–62*).—A detailed examination is reported of the reliability of various methods of testing for adulteration of milk, particularly watering, when the milk samples have soured through standing.

Souring to the point of curdling was found to alter but little the specific gravity of the milk but to produce marked changes in the dry residue. The fat determination of milk neutralized with ammonia gave results comparable to those with sweet milk. The optical refraction of the calcium serum of strongly watered milk differed markedly from that of normal milk. The values for the dry residue of the calcium serum and the fat- and nitrogen-free dry residue varied proportionately with the optical refraction. These values are thought to be the most satisfactory for distinguishing normal milk from abnormal.

If the refraction values are low, the determination of chlorin is considered advisable in order to tell whether the milk is watered or only abnormal. A normal refraction for the chlorin content indicates abnormal milk but no adulteration.

The freezing point determination is considered a valuable method for the detection of watering, particularly when only a small amount has been added, but it is thought to be inapplicable to sour milk.

[Report of the Louisiana Stations] chemical research department, J. F. Brewster (*Louisiana Stas. Rpt. 1923, pp. 10, 11*).—An examination of the coloring matter of sugar cane rind has demonstrated that all varieties contain chlorophyll, xanthophyll, and carotin and two potential coloring matters, saccharetin and tannin. Purple and other dark-colored varieties contain in addition another pigment which was formerly considered to be an anthocyan, but which in the opinion of the author belongs to some other group.

In a study by the author and H. H. Dodds of the coloring matter formed by the action of alkali upon reducing sugars in cane juice, spectrophotometric examination of the color has shown it to be a nearly pure yellow.

A process of sugar clarification is being studied in which the usual procedure of sulfitation is reversed. The juice is first clarified with lime and the clear juice then lightly sulphured. It is stated that if the process is carefully controlled as to H-ion concentration good white sugar and molasses are obtained with a much more complete elimination of impurities, a considerable reduction in the sulphur content of the molasses, and a decreased deposition of scale upon the heating surfaces.

[Report of the Louisiana Stations] bacteriological research department, W. L. Owen (*Louisiana Stas. Rpt. 1923, pp. 12–16*).—In this progress report, in addition to studies which have been noted previously (E. S. R., 49, pp. 613, 614; 51, p. 13), and on page 809 in this issue, a brief report is given of a study of the action of several vegetable carbons in the removal of microorganisms from juices and sirup.

The efficiency of the various carbons in the removal of microorganisms did not appear to be correlated with the removal of organic impurities. The predominant types were, however, altered and their rate of development retarded. This is thought to be due to changes in the type and amount of nutritive material removed. A study of the rate of development of microorganisms in juices stored at high and low temperatures failed to show any detectable changes in composition in three hours. Reported deterioration of juice during milling is attributed to excessive degrees of infection.

Chemistry and confectionery, S. JORDAN (*Indus. and Engin. Chem., 16 (1924), No. 4, pp. 336–339*).—In this discussion of the relation of chemistry to candy manufacture the raw materials in most general use are listed, the more familiar types of confectionery are listed and their general manufacture outlined, and the attendant chemical problems discussed briefly.

Constructive chemistry in relation to confectionery manufacture, H. S. PAINE (*Indus. and Engin. Chem., 16 (1924), No. 5, pp. 513–517*).—This contribution from the Bureau of Chemistry, U. S. D. A., consists of a discussion of the chemical and physical theories of the processes involved in candy manufacture, and an application of some of these principles to the manufacture of fondant with the use of the enzyn invertase. By varying the amount of invertase used, its action in hydrolyzing a portion of the sucrose, with resulting increase in solubility and softness, can be made to proceed at different rates, depending upon the type of candy and time to be considered.

Three groups of fondant confections are considered. In the first group, consisting of cheap bulk goods prepared with a maximum proportion of corn sirup, the minimum proportion of invertase is used, an amount just sufficient to cause the inversion to occur slowly at such a rate as to compensate as nearly as possible for the effect of evaporation. Group two comprises medium and higher priced package goods, including advertised brands which may be shipped and sold over considerable territory. For these a larger proportion of invertase is used to produce a rather soft center. Group three includes types of candy in which it is desired to produce complete liquefaction after manufacture. Other special uses of invertase in various types of candy other than fondant candy are discussed.

Home canning, W. V. CRUESS and A. W. CHRISTIE (*California Sta. Circ. 276 (1924), pp. 37, figs. 11*).—This circular, which supersedes Circular 158 (E. S. R., 36, p. 509), contains a discussion of the general principles of canning and of methods, materials, and equipment, followed by special directions for canning fruits, vegetables, and meats. These directions are also summarized in tabular form. A brief section on ptomain and botulinus poisoning emphasizes the necessity of pressure sterilization for all vegetables except rhubarb and tomatoes.

Drying prunes in Oregon, E. H. WIEGAND (*Oregon Sta. Bul. 205 (1924), pp. 3–26, figs. 24*).—The data reported and the conclusions drawn in this publication are the result of a series of experiments carried out at the station in cooperation with R. Powers, of the Bureau of Chemistry, U. S. D. A., on the effect of various pretreatments, drying temperatures and humidities on the rate of drying and the quality of dried Italian prunes. The topics discussed include sanitation in handling, growing and harvesting the fruit, preparing the fruit (grading, dipping, traying), drying, and processing and packing.

The importance is emphasized of the use of first quality fresh fruit and of sanitary conditions in the handling of the fruit before drying. Grading the fruit before drying is considered in general inadvisable on account of danger of bruising. Lye dipping is considered unessential, although it increases the drying rate if the humidity is high. If lye is used, the solution should not be over 1.5 per cent concentration and should be boiling hot. The prunes should be kept only a short time in the lye and should be washed thoroughly before drying. No metal trays have been found which give entirely satisfactory results. The galvanized iron tray is in general use in Oregon.

In drying, the type of drier is considered less essential than the proper conditions of temperature, humidity, and circulation. For Italian prunes these are given as temperature 150 to 165° F., circulation 600 to 750 lineal feet per minute, and humidity 15 to 30 per cent. Specifications are given for a tunnel drier to meet these conditions. Processing with steam in a shaker processor is recommended as giving better results than the use of hot water and a drum type of processor.

Vinegar fermentation and home production of cider vinegar, A. R. LAMB and E. WILSON (*Iowa Sta. Bul. 218, abridged ed. (1923), pp. 4*).—This is an abridged edition of Bulletin 218 (E. S. R., 50, p. 113).

Furfural from corncobs.—IV, Economic aspect of furfural production, G. H. MAINS and F. B. LAFORGE (*Indus. and Engin. Chem., 16 (1924), No. 4, pp. 356–359, fig. 1*).—This paper concludes the series of reports on furfural production from corncobs (E. S. R., 50, p. 806), with a discussion of various factors of importance in connection with the commercial utilization of the process developed. These include the possible market for furfural, plant location, size and equipment, power and fuel requirements, and cost of production. The total estimated cost of production for a plant handling 50 tons of cobs a day is estimated at 6.15 cts. per pound of furfural produced.

Alcohol from cane blackstraps.—Effect of varying additions of acid, W. L. OWEN and J. D. BOND (*Indus. and Engin. Chem., 16 (1924), No. 4, pp. 387–392, fig. 1*).—The acid requirements (sulphuric) for Cuban and Louisiana blackstrap molasses for maximum yield of alcohol on fermentation with various yeasts have been determined at the Louisiana Sugar Experiment Station.

The requirements were found to vary with the strain of yeast used as well as with the source of the molasses, the variation with respect to yeast being greater for the Louisiana than for the Cuban molasses. Insufficient amounts of acid were found to lower the yield of alcohol by all of the yeast cultures from both types of molasses. It is concluded that the acid requirement of any molasses for alcohol manufacture should be determined for each type of yeast used.

Report on the fermentation industries for 1923, H. L. HIND (*London: Soc. Chem. Indus. and Inst. Brewing, 1923, pp. 35*).—This report consists of a brief review of recent literature on fermentation, followed by a progress report on various investigations conducted by the Institute of Brewing.

METEOROLOGY.

On a simple method of recording the total and partial intensities of solar radiation, L. GORCZYŃSKI (*U. S. Mo. Weather Rev., 52 (1924), No. 6, pp. 299–301, pls. 2, fig. 1*).—A simple form of recording pyrheliometer obtained by combining a thermopile of the Moll type with a recording voltmeter of the Richard type is described, and tests of it are reported. The apparatus is stated to possess "in high degree the desired qualifications, namely, quickness of action, great sensitivity, and absence of zero error. On the other hand, the rugged construction of the thermopile, the simplicity of the whole instrument, and especially of the recording voltmeter, make the new pyrheliometer very easy for current use not only by the meterological observatories but also by less experienced observers at ordinary meteorological stations. The results already obtained in the desert regions of North Africa and in the plains of Europe, as well as comparisons just made between this instrument and the Marvin and the Smithsonian pyrheliometers at Washington, D. C., show its convenience and the practical adaptation of the measurements obtained with the new recording pyrheliometer in the different climates."

[The increasing attention which is being given to the relation of light to plant and animal growth and health gives special significance to studies such as these, having in view the simplification and extension of the exact measurement of light intensities.]

The cotton plant in relation to temperature and rainfall, J. B. Kincer (*U. S. Mo. Weather Rev., 52 (1924), No. 6, pp. 306, 307, figs. 2*).—This article reproduces and comments upon two graphs published by C. B. Williams in an article previously noted (E. S. R., 50, p. 415). It is pointed out that "with respect to the United States the precipitation shown represents the amount occurring in the extreme western portion of the cotton-growing area (Abilene, Tex.), and this again does not well represent moisture conditions in much the greater portion of the American Cotton Belt. In the central and eastern cotton-growing districts precipitation is much heavier, but at the same time the seasonal distribution holds very well. That is, there is usually less rainfall during the picking season than during the period of active growth."

Monthly Weather Review, [May–June, 1924] (*U. S. Mo. Weather Rev., 52 (1924), Nos. 5, pp. 249–298, pls. 11, figs. 11; 6, pp. 299–336, pls. 15, figs. 3*).—In addition to detailed summaries of meteorological, climatological, and seismological data and weather conditions for May and June, 1924, and notes, abstracts, and reviews, these numbers contain the following contributions:

No. 5.—Ascensional Rate of Pilot Balloons (illus.), by W. C. Haines; The Probability of Certain Minimum Temperature in the Santa Clara Valley, California, in Spring (illus.), by E. S. Nichols; Forest Fires and Storm Movement (illus.), by E. F. McCarthy; Lightning Fire Losses (illus.), by R. N. Covert; Tornado of June 22, 1923, at Fort Yates, N. Dak., by A. McG. Beede; Tornado at Northfield, Minn., May 3, 1922 (illus.), by U. G. Purssell; Is the Accuracy of Precipitation Measurements Dependent upon the Area of the Receiver of the Gage? by F. Lindholm; Present Methods of Glacier Study in the Swiss Alps, by J. E. Church, jr.; Wind Directions and Velocities, Nashville, Tenn. (illus.), by R. Nunn; Physiological Heat Regulation and the Problem of Humidity, by E. P. Lyon; The Unseasonable Weather of May, 1924, by A. J. Henry; Destruction of an Aerial during a Thunderstorm, by I. F. Hand; and an obituary notice and appreciation of Clarence LeRoy Meisinger, 1895–1924, by W. J. Humphreys.

No. 6.—On a Simple Method of Recording the Total and Partial Intensities of Solar Radiation (illus.), by L. Gorczyński (see p. 809); Intercomparison of Pyrheliometers, by H. H. Kimball; Investigations Relative to the Polar Front, by J. W. Sandström; The So-called Monsoonal Winds of Texas, by A. J. Henry; The Cotton Plant in Relation to Temperature and Rainfall (illus.), by J. B. Kincer (see above); On the Probability of Rain, by L. Besson, trans. by B. M. Varney; Summary of Correlations Between Hawaiian Rainfall and Solar Phenomena, by J. B. Cox; The Lorain, Ohio, Tornado of June 28, 1924 (illus.), by H. C. Hunter; The Southern Maryland Windstorm of June 8, 1924, by B. F. Dashiell; and Record Cloudburst Flood in Carter County, Tenn., June 13, 1924 (illus.), by W. R. King.

Attention is called to the fact that specific data on occurrence of hail reported by approximately 5,200 observers in the United States will hereafter be a regular and distinct feature of the *Monthly Weather Review*.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and H. H. SHEPARD (*Massachusetts Sta. Met. Buls. 427–428 (1924), pp. 4 each*).—Summaries are given of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1924. The data are briefly discussed in general notes on the weather of each month.

[Weather conditions at Edgeley, Hettinger, Langdon, and Williston Substations, N. Dak., 1921 and 1922], O. A. THOMPSON, U. J. DOWNEY, L. JORGENSON, and A. C. KUENNING (*North Dakota Sta. Bul. 174 (1924), pp. 76–78, 80, 82, 83, 84, 90*).—Observations on temperature and precipitation are briefly summarized, with special reference to crop growth at these substations. The seasons of 1921 and 1922 were dry at Edgeley, resulting in short crops. The conditions were unfavorable at Hettinger in 1921 but good in 1922, resulting in the best crops since 1915. The season of 1921 was fair at Langdon and almost ideal in 1922. The frost-free period was unusually long at Williston in both years. The rainfall was above the normal but not well distributed in 1921.

Weather observations, J. B. THOMPSON (*Virgin Islands Sta. Rpt. 1923, pp. 5–7, fig. 1*).—Observations on rainfall and evaporation at the Virgin Islands Station during 1923 are summarized and compared with similar data for previous years. This was the fourth successive year of steadily increasing drought. The total annual rainfall, 28.79 in., was the lowest in 70 years. Evaporation from a water surface amounted to 79.63 in. The excessive drought conditions were reflected in greatly reduced crop yields.

SOILS—FERTILIZERS.

Different types of soil formation and the classification of the resulting soils, C. D. GLINKA (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 2 (1924), No. 1, pp. 1–12, pls. 2*).—In a contribution from the Agricultural Institute of Petrograd, Russia, the author attempts to classify Russian soils largely on the basis of the processes governing their formation. It is pointed out that the parent rock has only a secondary influence upon the process of soil formation, which depends in the first instance upon external factors, of which climatic conditions are the most important.

Strength and weaknesses of soils, C. B. WILLIAMS (*North Carolina Sta. Rpt. 1923, pp. 31–34*).—A brief review is given of the fertility of North Carolina soils, including data on average composition of the main soil types. These indicate that the predominant typical soils of the Coastal Plain and Piedmont regions of the State are much more poorly supplied generally with nitrogen, phosphoric acid, and potash than are the typical cultivable mountain soils.

Soil types of North Carolina found specially suited for growth of different crops, C. B. WILLIAMS (*North Carolina Sta. Rpt. 1923, pp. 46–55*).—A list of crops best adapted for growth on some of the leading types of soil in North Carolina is presented.

Soil survey of Greenville County, South Carolina, W. I. WATKINS ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+189–212, fig. 1, map 1*).—This survey deals with the soils of an area of 505,600 acres lying partly within the Piedmont Plateau and partly within the Appalachian Mountain region in northwestern South Carolina. The topography of the

Piedmont Plateau portion varies from almost level to hilly, and of the mountainous portion from hilly to mountainous. Drainage is well established throughout the county.

The soils are said to be prevailingly deficient in organic matter. Including rough stony land, meadow, and rock outcrop, 17 soil types of 8 series are mapped, of which Cecil sandy clay loam and sandy loam cover 38.4 and 24.4 per cent of the area, respectively.

The soils of Rutherford County, C. A. Mooers and H. H. Coryell (*Tennessee Sta. Bul. 130 (1924), pp. 27, pl. 1, figs. 6*).—The results of a survey of the soils of Rutherford County made by the station in cooperation with the Tennessee State Geological Survey are reported, together with the results of chemical analyses of samples of the prevailing soil types and of field experiments to determine fertility requirements and crop adaptations.

The results are taken to indicate that the soils of the county are naturally fertile, but are somewhat deficient in phosphoric acid and lime. Apparently potash is of subordinate importance in the management of these soils. Fertilizer formulas and recommmendations for fertility practices are included.

Soil survey of Walworth County, Wisconsin, W. J. Geib et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1920, pp. IV+1381–1430, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Wisconsin Geological and Natural History Survey and the University of Wisconsin, deals with the soils of an area of 358,400 acres in southeastern Wisconsin. The most important topographic feature within the county is the terminal moraine of the Lake Michigan and Green Bay glaciers. Within this morainic belt the topography ranges from rolling to extremely rough and broken. Outside of the belt the topography ranges from level to gently rolling. Branches of various streams are said to form drainage outlets for practically all parts of the county.

The soils are derived chiefly from glacial drift, some of which has been worked and redeposited by the action of water. Including peat, 28 soil types of 14 series are mapped, of which the Bellefontaine and Miami silt loams cover 21.4 and 12.2 per cent of the area, respectively.

Field measurement of soil moisture, F. Hardy (*Trop. Agr. [Trinidad], 1 (1924), No. 7, pp. 98–100, fig. 1*).—An account is given of the use of the so-called soil point method in a physiological study of soil moisture. It is pointed out that this method offers a means of studying such problems as the effect of different kinds of mulches in soil moisture conservation, the effect of various manurial treatments on the water relations of soils, and the differences that various crops exhibit as regards their water requirements at different stages of growth and the response which the soil shows to these demands.

Some trends in soil microbiology, A. G. Lochhead (*Sci. Agr., 4 (1924), No. 10, pp. 308–313*).—In a contribution from the Central Experimental Farm, Ottawa, a brief review is given of some of the trends in research in soil microbiology. Attention is drawn to the fact that while other branches of microbiology have been developed to a practical point, the direct application of soil bacteriology to farming methods is as yet extremely limited.

A bibliography of 48 references bearing on the subject is appended.

[Soil bacteriological studies at the Idaho Station] (*Idaho Sta. Bul. 133 (1924), p. 10*).—It is stated that various tree products exhibit a notable toxicity toward ammonification, nitrification, and nitrogen fixation in Idaho soils. Soils collected from timber areas do not contain the nitrogen-fixing organism, but will support it when inoculated.

Studies of the effect of alkali salts on ammonification and nitrogen in crop yield are said to have indicated a decreasing toxicity as the salts remain in contact with the soil.

Investigations on the ammonia and nitrate contents of soil [trans. title], E. HASELHOFF and F. HAUN (*Landw. Vers. Sta., 102 (1924), No. 1-2, pp. 90-103*).—Studies on the influence of cropping and different fertility treatments, including fallowing, green and stable manuring, and mineral fertilization, on the ammonia and nitrate contents of soil are reported.

The results showed that while there were marked variations in the contents of total nitrogen as well as in ammonia and nitrate during the experiments, there were no uniformly occurring differences in this respect between fallowed and cropped soils. Different crops exhibited varying requirements for nitrogen and assimilated it differently.

The most ammonia and nitrate were found in the upper strata of both fallowed and cropped soils. The most ammonia was found in the fallowed soil and the most nitrate in cropped soil.

Time of year had a lesser influence on the ammonia content than on the nitrate content, especially in cropped soil. In general, the nitrates decreased during the fall and winter and increased during the spring and summer until harvest time, after which they almost disappeared. Such general variations did not occur in the ammonia content. Decreases in ammonia frequently followed increases in nitrates, although there was no regularity in such occurrences. The ammonia content of soil was, however, generally least at harvest time.

Fallowing, stable manuring, and green manuring had a marked influence upon nitrification in soil. In soils planted to potatoes and oats, nitrification was not essentially different where the soils were untreated from that in soils receiving stable manure, green manure, or fallow treatment.

Green manuring with clover and peas had a more favorable influence upon nitrification than stable manuring.

In general the total nitrogen content as well as the ammonia and nitrates of the soil decreased with the depth, and this was true whether root crops or grain crops were grown.

Studies on the nitrogen supply of cultivated soil [trans. title], E. HASELHOFF (*Landw. Vers. Sta., 102 (1924), No. 1-2, pp. 73-89*).—Studies conducted for nine years on the influence of fallowing, of green manuring with red clover, peas, and serradella, and of fertilization with stable manure on the nitrogen content of loam soil are reported.

The results showed that during the first year after fallow the nitrogen yield was greater from all plats whether or not organic fertilization was practiced. This was true with either fall or spring fallow. However, this difference disappeared in the second year. This is taken to indicate that no increased amount of available nitrogen existed in the fallow soils, but that it was merely indicated by a higher nitrogen content of the harvested plants.

The nitrogen losses were greater from soil receiving organic fertilization than from unfertilized soils, the greatest loss following fertilization with stable manure, especially in the earlier experimental periods.

There was a smaller utilization of nitrogen by crops from soils which had been fallowed except where stable manure was used.

The best utilization of the nitrogen from the green manure crops was from the peas and the poorest from the serradella. On soils receiving no organic nitrogen fertilization, the total crop yield, as well as the nitrogen utilization, was greater where no fallowing was practiced. A comparison of the nitrogen decrease in the soil when cropped with the amount of nitrogen in the harvested crop showed that the former is relatively less after fallowing than in unfallowed soil. This is taken to indicate that fixation of air nitrogen is an important consideration in fallowed soils.

Lime requirement of soil from the plant physiological standpoint [trans. title], O. ARRHENIUS (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 3, Wiss., pp. 129–151, figs. 2*).—This is a summary of work by the author and others on the subject indicating that methods are available for determining soil reaction, for estimating the necessary quantity of lime to change the soil reaction to a certain degree, and for determining the quantity of lime which occurs in the soil solution absolutely and relatively.

These methods include the colorimetric determination of reaction, the determination of the buffer action of soil, and the leaching method for investigating the composition of soil solutions.

The content of carbon dioxid in soil air [trans. title], E. HASELHOFF and O. LIEHR (*Landw. Vers. Sta., 102 (1924), No. 1–2, pp. 60–72*).—Studies are reported which showed that the rapidity of the decomposition of organic matter in soil depends upon the stage and condition of development of the plants. It proceeds more rapidly the younger and more tender the plant material. The carbon dioxid content of the soil air after stable manure fertilization was found to be not essentially different from that after green manuring, and any initial differences are soon equalized.

The carbon dioxid content of the air in the deeper layers of soil was found to be greater than in the surface layers. No uniform relations were established between the greater carbon dioxid content of the air of the deeper layers and rainfall and the soil temperature.

[Soil fertility studies at the Indiana Station] (*Indiana Sta. Rpt. 1923, pp. 46–51, figs. 2*).—The results of general soil fertility experiments are briefly summarized.

[Fertilizer and soil acidity studies at the Indiana Station] (*Indiana Sta. Rpt. 1923, p. 54*).—Pot tests with various crops showed that rock phosphate of various degrees of fineness produced crop increases equal to 49 per cent of those produced by acid phosphate. The addition of sulphur to the ordinary rock phosphate reduced the availability from 49 to 47 per cent, while the addition of calcium carbonate reduced it to 8 per cent.

Studies of limed field plats showed that all forms of lime tend to sink slowly into the soil and gradually reduce the acidity of the subsoil.

[Soil fertility studies at the Nebraska Station] (*Nebraska Sta. Rpt. [1923], pp. 17–19*).—General soil fertility experiments conducted at the station farm are said to have shown that applications of manure have given small but consistent yields on all crops. The largest increase of wheat and oats resulted from the heaviest application of manure and in the year following its application. With corn, the largest increase occurred the second year after application. Applications of phosphorus failed to give a consistent increased yield of oats and wheat. The effect of applications of nitrogen on oats and wheat has been seasonal, a small increase being obtained in seasons unfavorable for the development of soil nitrates. No commercial fertilizer has given consistent increases in the yields of corn or alfalfa.

Studies of the influence of moisture, temperature, aeration, and organic matter on the rate of nitrate accumulation in Nebraska soils are said to have shown that the rate of nitrate accumulation under temperature conditions that may obtain from late fall to May 15 is not sufficiently high to meet the needs of wheat or oats, but that the rate at which nitrate accumulates at summer temperature is sufficiently high to meet the demands of the corn plant. The limited moisture conditions that obtain during the large part of the seed bed preparation season for wheat are said to also seriously reduce nitrate accumulation. It was found that aeration is probably not a serious factor in nitrification under Nebraska conditions. The most important finding has been the very low rate of nitrate accumulation in soils which have been depleted of their organic matter.

Studies of the extent of acid soils in Nebraska, including an examination of more than 550 samples of soil collected from more than 160 areas, are said to have shown that acid soils are more widely distributed through Nebraska than has been commonly thought. The Drift Hill region in southeastern Nebraska is the most acid. The Shelby and Carrington loam types in Johnson, Pawnee, and Gage Counties are the most seriously acid soils in the State. The Loess Hills soils are slightly to medium acid, depending upon the extent to which erosion has laid bare the calcareous subsoil. The Loess Plains soils are said to become less acid, and the calcareous horizon comes closer to the surface as the rainfall decreases westward across the State. The acidity found in Nebraska is due to leaching.

[Miscellaneous soil fertility studies at the North Carolina Station], C. B. WILLIAMS (*North Carolina Sta. Rpt. 1923, pp. 38–43*).—Data from the results of soil fertility studies on the different soil types of the State are briefly summarized, together with data on chemical studies of the same soils.

Management of cane soils, J. O. CARRERO (*Porto Rico Sta. Rpt. 1923, pp. 3, 4*).—Studies of the nitrogen economy in fairly rich clay cane soils are said to have shown that when no nitrogen was used unlimed soils yielded one and one-half times as much as did the limed soils, the gains holding regardless of whether green manure was used. When nitrogen was applied the unlimed soils were still ahead of the limed soils in yield, but the difference between them was small, especially when sodium nitrate was used as a source of nitrogen. Apparently lime considerably depressed the effect of phosphoric acid.

Fertilizer experiments on cane, F. A. LÓPEZ DOMÍNGUEZ (*Porto Rico Dept. Agr. and Labor Sta. Bul. 29 (1923), pp. 39*).—Two series of experiments with fertilizers on cane begun in 1911 on lowland soils along the river courses and on hill soils back of the coast on the Island of Porto Rico are reported.

The experiments on the lowland soils showed that lime is necessary for cane production in this soil, but is not sufficient of itself to produce maximum crops. Nitrogen is the most important element for cane fertilization in this soil, with phosphoric acid and potash of lesser and about equal importance. Large amounts of nitrogen alone are not sufficient to produce profitable crops. The soil is very poor, requires periodical resting, and fairly large amounts of complete fertilizers for best yields. The use of tankage as a fertilizer is considered inadvisable.

The experiments on hill soils indicated the profitable use of all three fertility elements, and that none may be omitted in cane fertilization. The use of extra amounts of both nitrogen and phosphoric acid, especially the latter, was demonstrated to be profitable.

Fertilizers: What they are and how to use them, M. M. MCCOOL and C. E. MILLAR (*Michigan Sta. Spec. Bul. 133 (1924), pp. 26, figs. 24*).—Practical information on the purchase, selection, and use of fertilizers and fertilizer materials is presented, with particular reference to the requirements of Michigan soils and cropping practices. Among other points, attention is drawn to home mixing of fertilizers and the attendant saving.

What is the value of a ton of stable manure? A. G. McCall and T. H. White (*Maryland Sta. Bul. 266 (1924), pp. 259–286, figs. 4*).—The results of 36 tests with field crops on 8 different fields and with a variety of truck crops to determine the value of stable manure as indicated by crop yields are reported.

The average return from the field crop tests amounted to $5.28 per ton of manure applied, and that from the truck crops, over a period of 21 years, was $8.67 per ton of manure.

Light dressings usually gave larger returns per ton of manure than the heavier applications. When the supply of manure is limited, it is considered to be good practice to make frequent light applications rather than heavy applications at long intervals. Fresh manure hauled directly to the field and spread immediately some time in advance of the growing season gave better results than manure which was hauled to the field and permitted to rot in small piles. Applications of manure to limed soil gave larger increases than on unlimed soil.

The use of manure on some of the old worn soils of southern Maryland more than doubled the yield of all of the crops in a rotation. The addition of lime and phosphorus greatly increased the efficiency of the manure on these soils. Ten tons of manure applied at the rate of 5 tons per acre on two different crops in a rotation gave larger increases than the same amount of manure used in the form of a single 10-ton application on one crop in the rotation.

The best returns for truck crops were secured when the manure was used on spinach, peas, potatoes, and cabbage.

Action of fallow, stable manure, and green manuring in addition to mineral fertilization [trans. title], E. Haselhoff (*Landw. Vers. Sta., 102 (1924), No. 1–2, pp. 104–121*).—Field experiments to determine the influence of stable manuring, fallowing, and green manuring with serradella, peas, and red clover in addition to mineral fertilization on wheat, potatoes, rye, and oats are reported.

The results showed in general that no noteworthy increases in crop yield could be attributed to fallowing or green manuring. Stable manure apparently produced the most favorable results. These practices produced no essential change in the composition of the crop as regards nitrogen content.

Investigations on the biochemical conditions of a soil receiving varying organic fertilization [trans. title], E. Haselhoff and O. Liehr (*Landw. Vers. Sta., 102 (1924), No. 1–2, pp. 43–59*).—This is a brief summary of different work by the authors and others on the influence of organic fertilization upon bacterial numbers, ammonification, nitrification, and nitrogen fixation in a mild loam soil. No final conclusions are drawn.

Chemical and biological studies with cyanamid and some of its transformation products, K. D. Jacob, F. E. Allison, and J. M Braham (*Jour. Agr. Research* [*U. S.*], *28 (1924), No. 1, pp. 37–69, figs. 12*).—Studies conducted at the U. S. D. A. Fixed Nitrogen Research Laboratory on the changes which cyanamid nitrogen and its transformation products undergo in the soil are reported.

Cyanamid was rapidly converted into its various decomposition products, chiefly urea and ammonia. Tests for cyanamid showed none present after from 5 to 10 days, depending upon the rate of application. Urea was likewise present for only very short periods, being broken up into ammonia so rapidly that no accumulation occurred. Other decomposition products of cyanamid which were precipitated by silver nitrate were present in soils receiving cyanamid for a considerable period after applying.

The nitrification of cyanamid usually took place more slowly than that of urea or ammonium sulphate, and the larger the application the slower was the process. After the initial retarding period of from 2 to 4 weeks, nitrification proceeded at a more nearly normal rate. Some of the transformation products of cyanamid were toxic to the nitrifying bacteria, and where present in appreciable amounts indirectly caused an ammonia accumulation.

Cyanamid which had been hydrated and oiled nitrified at practically the same rate as did the untreated material. The slight difference in favor of the latter is thought to have been due to the presence of a trace of dicyandiamid in the hydrated material and not to the presence of the oil. The addition of calcium carbonate to soil receiving cyanamid retarded nitrification, contrary to the results obtained with urea and ammonium sulphate. This peculiar behavior is attributed to a probable increase in dicyandiamid formation in the presence of calcium carbonate.

The rate of nitrification of cyanamid at different moisture contents was highest at one-fourth of saturation, while for urea the rate was higher with both one-half and three-fourths than with one-fourth. The maximum nitrate accumulation for both fertilizers was with 30 per cent moisture, but in the case of cyanamid the amounts of nitrate present after 2 months were very nearly the same with either 10, 21, or 30 per cent. With 40 per cent moisture there was little, if any, nitrate formation. Nitrate formation from cyanamid was more rapid and complete at 38.5° C. (101.3° F.) than at lower temperatures. At room temperature no nitrification took place in one experiment after 42 days. At 30° the results were intermediate. Under similar conditions urea nitrified at all temperatures, the rate rapidly increasing up to 30° but decreasing at 38.5°. The partial sterilization of soil with phenol practically stopped all nitrification of cyanamid.

Dicyandiamid when added to soil slowly disappeared, more than one-half being decomposed during a period of 2 months. In all cases where dicyandiamid was applied the nitrate formation from the soil organic matter was markedly retarded. The nitrification of ammonium sulphate in the presence of dicyandiamid was prevented for a period of 210 days where the dicyandiamid was used at the rate of 10.5 mg. per 100 gm. of soil. Even as little as 0.1 mg. per 100 gm. of soil greatly delayed nitrification. The rate of ammonification of urea was not appreciably affected by concentrations of dicyandiamid as high as 315.2 mg. per 250 gm. of soil.

Guanylurea sulphate decomposed to ammonia very slowly, and the ammonia so formed did not accumulate but was nitrified.' Where urea was used with guanylurea sulphate, the latter did not affect ammonification but did inhibit nitrification for some weeks. The injurious effect was not nearly so great as in the case of dicyandiamid.

Salts of guanidin, including guanidin nitrate and guanidin carbonate, depressed nitrification for several weeks, the period depending upon the rate of application. Thereafter nitrates formed quite rapidly. Nitro guanidin showed a maximum nitrification of 17 per cent after 50 days. Biguanid nitrate acted practically like an inert material. A 3 per cent depression in nitrates at first was followed by a 9 per cent nitrification after 50 days.

Influence of oils on the fertilizing value of lime nitrogen [trans. title], M. Górski and Z. Prótowa (*Rocz. Nauk Rolnicz., 10 (1923), No. 3, pp. 603–616, fig. 1*).—Studies are reported which showed that the oiling of lime nitrogen retarded the decomposition of the calcium cyanamid in soil. There was no great difference in this respect between tar and mineral oils. Pot experiments with light soils showed that tar oils injured crops and decreased their yields. Mineral oils exerted no influence of this nature.

Toxic action of lime nitrogen and its constituents [trans. title], R. W. Beling (*Landw. Vers. Sta., 102 (1924), No. 1-2, pp. 1-35*).—Studies are reported, the results of which showed that of the constituents of lime nitrogen the cyanamid which is set free is the most active. This compound is generally transformed so rapidly into urea in the soil that any biological disturbances produced are of short duration.

While dicyandiamid is admittedly injurious to nitrification, it is thought that the normal use of lime nitrogen does not produce enough to cause serious trouble. The same applies apparently to the caustic lime set free in the soil by lime nitrogen.

Decomposition of urea in soil [trans. title], F. Littauer (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 3, Wiss., pp. 165-179*).—Studies on the influence, temperature, lime salts, and soil moisture on the decomposition of urea in loam and sand soil are reported.

The results showed that the speed of decomposition of urea in soil depends upon the soil type, soil moisture, and temperature. The loam soil offered the most favorable conditions for urea decomposition. Dryness retarded urea decomposition, but an increase in the soil moisture above the average water capacity produced no essential change in urea decomposition.

These results are taken to indicate that urea will decompose very rapidly in soils rich in bacteria and well supplied with moisture.

Phosphoric acid fertilization experiments with superphosphate, Thomas meal, Rhenania phosphate, and dicalcium phosphate on four different soil types [trans. title], H. Niklas, A. Strobel, and K. Scharrer (*Landw. Jahrb., 59 (1924), No. 5, pp. 641-672*).—Experiments are reported which showed that as an average for all crops and soils superphosphate and Rhenania phosphate gave almost the same results, and that dicalcium phosphate gave results only slightly less valuable than these two. The poorest results were given by Thomas meal. Soil reaction had a certain influence upon the activity of the different phosphates.

All the soils used were deficient in available phosphoric acid, and there was a more or less important action of all of the fertilizers used thereon. There was no fixed relation between the phosphoric acid requirements of these soils and their contents of phosphoric acid as determined analytically. Superphosphate gave its best results on alkaline and neutral soils.

The recovery of potash from kelp: A review, S. C. Robison (*Sci. Agr., 4 (1924), No. 10, pp. 314-321, fig. 1*).—This is a review of work on the occurrence, composition, and harvesting of kelp, and on processes for the recovery of potash and iodin in this material. Data from experiments on the use of kelp as a fertilizer from different sources are reported, together with a comparison of the manurial value of alunite, kelp, potassium sulphate, and potassium chlorid.

A summary of these results indicates that ignited alunite gave the best general results in relative growth, while potassium sulphate was second. The kelp produced a relative growth equivalent to that of potassium chlorid.

Specific action of the sodium chlorid in sylvinite on cultivated plants [trans. title], P. Lesage (*Ann. Sci. Agron. Franç. et Étrangère, 41 (1924), No. 2, pp. 109-121*).—Laboratory, garden, and field studies on the influence of the sodium chlorid content of sylvinite on crops are reported. In the majority of cases sodium chlorid, whether applied alone or as one of the normal constituents of sylvinite, apparently had no greater depressive action on crops than potassium chlorid, and in some cases its influence was slightly more favorable.

Investigations on the behavior of lime in soil [trans. title], O. Lemmann and L. Fresenius (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 1, Wiss., pp. 1–20, fig. 1*).—Studies are reported which showed that when soil is treated with caustic lime the latter soon combines with the soil constituents. This combination takes place either without an exchange of bases, or, if an exchange occurs, there is an extensive adsorption of the existing calcium hydroxid. When soil was treated with calcium chlorid or with calcium bicarbonate, base exchange prevailed.

The adsorption compounds of soil and calcium hydrate were not completely broken down by the action of carbon dioxid. A condition of equilibrium entered in between the adsorptive power of the soil and the combining power of the carbon dioxid. The capacities of different soils to combine with calcium hydrate varied widely. In general, the addition of calcium hydrate to soil hastened the decomposition of organic matter.

Filter-press cake as fertilizer, J. H. Ramírez (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1923, p. 48; also in Spanish ed., p. 48*).—Field studies on the use of filter press cake as a fertilizer for cane when used in different amounts are briefly reported, showing that the largest yields were obtained with the largest applications of the cake. However, the yield where 75 tons was used per acre was considerably less than four times that where 5 tons was used.

The mineral industry of the British Empire and foreign countries.—Statistics, 1919–1921: Nitrates (*London: Imp. Min. Resources Bur., 1924, pp. IV+37*).—This report summarizes a large amount of statistical data on the world's production of nitrates and of exports and imports by Great Britain and other countries.

1924 "year book" commercial fertilizer (*Atlanta, Ga.: Walter W. Brown Pub. Co., 1924, pp. 130, illus.*).—This number of this publication contains the usual list of fertilizer manufacturers, alphabetical and classified directories of allied trades, and a number of special articles on various phases of the manufacture, sale, purchase, and use of commercial fertilizers.

Fertilizer registrations, January 5, 1924, to May 19, 1924 (*Md. Univ. [Quart.], No. 107 (1924), pp. 27*).—A list of brands of fertilizers and fertilizer materials registered in the State of Maryland from January 5 to May 19, 1924, together with a statement of the guaranteed analyses and the sources of the nitrogen, phosphoric acid, and potash in each brand, are presented.

AGRICULTURAL BOTANY.

Hemerecology: The ecology of cultivated fields, parks, and gardens, J. W. Harshberger (*Ecology, 4 (1923), No. 3, pp. 297–306*).—It is the object of this paper to show how the principles of ecology can be applied to the farmer's and gardener's art. Hemerecology, as here used, means the ecology of cultivated fields, parks, and gardens. The principles are those which have been developed by ecologists and which have been used in the investigation of natural vegetation. The argument contained has been written to show that the time is ripe for the development of ecologic science along practical lines other than forestry, in which the applicability of ecology to the growth of a timber crop has long been recognized.

A working basis for the ecological classification of plant communities, G. E. Nichols (*Ecology, 4 (1923), Nos. 1, pp. 11–23; 2, pp. 154–179*).—The present contribution is partly a revision and amplification of an earlier one (E. S. R., 39, p. 28) along this same general line. Its chief aim is to set forth the essential facts and principles which underlie the ecological classification of plant communities, and to suggest a generalized scheme which may be used as a working basis in undertaking an ecological survey of the vegetation in any particular tract of country.

Starting with the plant association as the fundamental unit of vegetation, the author deals with this in its relation to the habitat as regards the general situation and the habitat factors; also, in the second part, with classification as based on physiognomy and ecological structure, on geographical relations, and on successional relations. The essential points to be emphasized are indicated.

"It is proposed that the term 'plant association' be recognized as applicable both to the abstract vegetation concept and to the concrete individual pieces of vegetation upon which this concept is based. . . .

"As subordinate communities within the association, societies of two sorts are distinguished—layer societies and group societies. . . .

"The ecological classification of plant associations consists in the arrangement into common groups of different associations which are related to one another by environment. These groups represent ecological vegetation units of a higher order than the association.

"There are three distinct points of view from which such a classification may be made. The associations may be grouped with reference to their physiognomy and ecological structure, with reference to their geographical relations, and with reference to their successional relations." These are discussed, as is also the method in its general bearings as an idea and as a guide in actual practice.

A common system of classification in plant and animal ecology, A. B. Klugh (*Ecology, 4 (1923), No. 4, pp. 366–377*).—This article, having an extensive bibliographical background, purports to show that there is at present no scheme of classification common to plant and animal ecology and no agreement as to the general method, the terminology, or the nomenclature of classification.

"While the idea of succession is of supreme importance in ecological studies, it does not furnish a satisfactory basis for ecological classification. The majority of plant ecologists agree that either the habitat or the vegetation itself, or both, furnish the basis of ecological classification, and as in zooecology the vegetation is part of the habitat, the habitat is the only logical basis of a common scheme of classification. This is in agreement with the practice of animal ecologists.

"No satisfactory concept of a 'formation' which is of universal application has yet been enunciated, and the term should be abandoned. The 'association' is the fundamental unit of ecological classification. For communities which differ in some major factor, but which do not differ sufficiently to be ranked as associations, the term 'systasis' is proposed. The term 'society' has been used in various senses and is not suitable for international usage. The term 'cenosis' is proposed to replace it. . . . An outline of a common system of ecological classification is presented."

Species and area, O. Arrhenius (*Jour. Ecology, 9 (1921), No. 1, pp. 95–99*).—An approximate formula is claimed to hold within wide limits as basing a standard for the relative richness or poorness of a floral district.

The species of an association are distributed according to the laws of probability The number of species increases continuously as the area increases, and the plant associations pass into each other quite continuously.

On the relation between species and area, H. A. Gleason (*Ecology, 3 (1922), No. 2, pp. 158–162, fig. 1*).—The formula of Arrhenius referred to above is claimed to be erroneous on the basis of data presented.

Age and area: A study in geographical distribution and origin of species, J. C. Willis (*Cambridge, Eng.: Univ. Press, 1922, pp. X+259, figs. 25*).—Of the two main parts of this book (which synthesizes the author's work extending over a period of 15 or 20 years), the first deals, broadly speaking, with the present state of the question of age and area in nine chapters, discussing the dispersal of plants into new areas; the introduction and spread of foreign species; acclimatization; causes which favor or hinder the dispersal of species; age and area, its confirmation by prediction, and invasions; and objections to the hypothesis. The second main part deals with the application of the age and area idea to the flora of the world and its implications, more specifically with the position of the age and area theory; the further extension of the application of age and area; size and space; age and area, and size and space, in the Compositae; age and area from a paleobotanical standpoint; endemism and distribution (species and genera) ; the monotypic genera and genera of larger size; the hollow curve of distribution; applicability of age and area to animals; the origin of species; age and area and the mutation theory; and geographical distribution (general).

Age and area, H. A. Gleason (*Ecology, 4 (1923), No. 2, pp. 196–201*).—This is a review of the publication above noted.

The transect of a mountain valley, C. G. Bates (*Ecology, 4 (1923), No. 1, pp. 54–62, figs. 3*).—The study here described, undertaken in the early part of July, 1921, was planned to test the conclusion reached from a much more extensive study of the forest types or associations in the vicinity of the Fremont Experiment Station, Colorado, extending over a period of about 10 years, to the effect that the zonal distribution of the important forest trees and the equally marked differences between the vegetative associations of opposing slopes at the same elevations are due primarily to differences in insolation and its effects upon the surface of the soil. The factors and conclusions are presented in some detail.

Types of vegetation in the semiarid portion of the United States and their economic significance, A. E. Aldous and H. L. Shantz (*Jour. Agr. Research* [*U. S.*], *28 (1924), No. 2, pp. 99–128, pls. 16, fig. 1*).—The authors describe the principal types of vegetation occurring on the unreserved public lands and the patented homestead lands west of the one hundredth meridian and briefly discuss the types with special reference to their economic significance to crop production and grazing. Keys are presented which indicate the value of the different types for the production of grain, cultivated forage crops, or for grazing, and also the carrying capacity of the different types.

The osmotic concentration, specific electrical conductivity, and chlorid content of the tissue fluids of the indicator plants of Tooele Valley, Utah, J. A. Harris, R. A. Gortner, W. F. Hoffman, J. V. Lawrence, and A. T. Valentine (*Jour. Agr. Research* [*U. S.*], *27 (1924), No. 12, pp. 893–924*).—In a previous publication (E. S. R., 30, p. 628) an account was given of an investigation on the relationship between the plant associations and the soil conditions in this valley. The purpose of the present investigation has been a consideration of the physicochemical properties of the leaf-tissue fluids of these indicator plants, with a view to determining whether the magnitudes of such constants as osmotic concentration, specific electrical conductivity, and chlorid content show a parallelism to the series of soil and vegetation types previously described.

The authors found that there was a close parallelism between the physicochemical properties of the tissue fluids of the native species of plants on the one hand and the characteristics of the soil and the capacity of the land for crop production on the other.

It is believed that the fact that few agricultural plants of importance have sap properties similar to the native desert species furnishes the explanation of the failure of crop plants in the more severe of the habitats of this region except as their conditions are modified by irrigation.

Seasonal changes in the water relations of desert plants, E. B. SHREVE (*Ecology, 4 (1923), No. 3, pp. 266–292, figs. 11*).—Having previously shown (E. S. R., 34, p. 728) some of the special features which enable a succulent perennial and a typical desert tree to endure drought conditions, the author presents herein the results from experiments with *Encelia farinosa*, a perennial shrub; *Streptanthus arizonicus*, a winter annual; *Amaranthus palmeri*, a summer annual; and the Papago bean (*Phaseolus* sp.).

The three native species showed an ability to increase their resistance to water loss with increasing aridity, and thus appeared to obey Le Chatelier's theorem. The cultivated plant did not show this phenomenon, but the system was destroyed, since the plant died under the more arid conditions.

"The results of investigations of anatomical structure, stomatal movements, and the lowering of leaf temperature by evaporation show that, while all of these phenomena aid in bringing about resistance to increasing aridity, they are not sufficient to account for the marked increase in resistance to water loss shown with increasing evaporating power of the air.

"For each species of the plants a number approaching a constant was obtained when the ratio T:(E×S) was calculated, T representing the transpiration per unit area for a 24-hour period, E the loss from an atmometer for the corresponding period, and S the water content of the soil per 100 gm. of dry weight. Thus it appears that transpiration varies with both the evaporating power of the air and the soil water content. A comparison of the daily and of the seasonal water content of plant parts with the transpiring power of the plants shows that the amount of water in the plant undoubtedly influences the rate of transpiration—that is, when the water content of the plant is lowered the capillary and colloidal imbibitional forces become greater."

Measurement of solar radiant energy in plant habitats, G. P. BURNS (*Ecology, 4 (1923), No. 2, pp. 189–195, pl. 1, fig. 1*).—The Marvin thermoelectric recorder, which shows the number of hours of sunshine, and the radioatmometer of Livingston are described, and data are presented as obtained by both these instruments. From the charts and data it is claimed that the Livingston radioatmometer offers the field ecologist a convenient, practical, and efficient method for measuring the amount of radiant energy available for plant growth.

The figures presented show that the amount of radiant energy is an exceedingly variable factor in various plant habitats.

The influence of light and of fluctuating temperatures on the germination of Poa compressa (L.), J. R. FRYER (*Sci. Agr., 2 (1922), No. 7, pp. 225–230, figs. 5*).—In experiments conducted during 1915, sunlight was found to be somewhat beneficial in germinating *P. compressa*. It is thought that daily fluctuations ranging between 16 and 35° C. (60.8 to 95° F.) are probably the best temperature conditions for germinating seeds of *P. compressa*.

The influence of relative length of daylight on the reversal of sex in hemp, J. H. SCHAFFNER (*Ecology, 4 (1923), No. 4, pp. 323–334, figs. 3*).—Continuing work previously noted (E. S. R., 48, p. 626; 49, p. 523), the author has carried on since 1917 a large number of experiments to determine to what extent the intensity of light, and more especially the relative length of the daylight period, were the cause of sex reversal.

"The experiments carried on with hemp during the past few years show that the ecological factor of relative length of daylight has a profound effect on the plant, not only in changing its size and complexity, its period of vegetative growth and maturity, and its conditions of senility and rejuvenescence, but also in determining the nature of its sexual expression. . . . The single factor of relative length of daylight to darkness causes a reversal of the sexual state in both directions. In the staminate plants the reversal is from maleness to femaleness, and at the same time it is from femaleness to maleness in the carpellate plants. The action of the light, therefore, probably goes deeper than merely the reduction of the food supply by reducing photosynthesis. It is conceivable that there may be a direct effect on the ultimate chemical and electrical activities of the cell. . . .

"The experiments show that the attempt to explain sexual expressions by hypothetical, homozygous and heterozygous, Mendelian, hereditary factors is of little value in the analysis of the sexual nature of diecious, dimorphic organisms like the hemp, even though a single sexual state seems to be established in the egg either before fertilization or in the zygote at or soon after the fertilization period. The problem is primarily physiological and ecological, the expression of the one sex or the other in the cells of the vegetative body, or its reversal to the opposite sex at any stage in the cell lineage of the vegetative cycle, being dependent on the character, intensity, and duration of the ecological factor involved, whether internal or external. In other words, the fundamental nature of sexuality is physiological rather than morphological. . . .

"Sex must . . . be due . . . to some fundamental physical or chemical state in the living cell, either in the protoplasm itself or in its inclusions. This state may be positive, negative, or neutral, and thus the sex of a cell or its vegetative descendants may be successively female, male, or neutral, in any order, the reversal being brought about both quantitatively and qualitatively by varying the factors of environment."

Influence of moonlight on movements of leguminous leaflets, F. C. Gates (*Ecology, 4 (1923), No. 1, pp. 37-39*).—The daily movements of leguminous leaflets have been summed up in the article previously noted (E. S. R., 36, p. 430).

The purpose of the present contribution is to record some data, obtained during the time of full moon in the Philippines, which showed the moon's influence in changing the normal movements of these types of leaves. In this work, which was carried on near the College of Agriculture at Los Baños, P. I., during 1914, movements resulting from the moon were noted repeatedly in *Gliricidia sepium*, *Leucaena glauca*, *Parkia timoriana*, *Derris elliptica*, a seedling palm, and a seedling meliaceous plant, being more intense on those whose leaflets were larger in size. The movement followed a complete closure of the leaf during the change from dusk to night; that is, in no case could the moon keep leaflets open from the day period into the night. The effect was more pronounced during the dry season, and upon warm nights with the temperature in the vicinity of 27° C. (80.6° F.). In the early morning the leaves resumed their night position before daylight, unless the full moon lasted into daylight, in which case the leaflets continued to expand to the normal day position.

Cambial temperatures of trees in winter and their relation to sun scald, R. B. Harvey (*Ecology, 4 (1923), No. 3, pp. 261-265, figs. 4*).—"The fluctuations which occur in the internal temperatures of trees in winter are of importance on account of their relation to sun scald, crotch injury, and related injuries to trees in northern climates. In Minnesota the coldest days in winter frequently have a bright sun. Injury to the cambium on the side of limbs exposed to the sun has been observed to be markedly greater than injury on the shaded side. . . .

"Recent improvements in the methods of measuring temperatures by thermocouples . . . have made it possible to measure the temperature of very small areas with thermal junctions having a lag less than 0.1 second. For this purpose the author has used copper-constantin junctions made of No. 30 or No. 40 wire. The great advantage of such junctions is that they can be inserted into very thin bark, and they do not introduce such errors as arise from the conduction of heat down the thermometer tube.

"Measurements of the temperature of the cambium and wood were made upon an Antonovka apple tree 8 in. in diameter at the base. . . .

"The effect of light absorption is to raise the temperature of the thin layer of dark-colored bark on the surface. As this layer warms up it radiates heat into the surrounding air. If a wind blows upon it, the heat is conducted away more rapidly than in still air. The cambium is warmed by conduction from the layer of bark which absorbs the light. The temperature of the bark depends upon the color of the surface, the intensity of the sunlight, the radiation of heat from the surface of the limb, and upon the conduction of heat inward. We are most concerned with the cambial temperatures because killing is most serious within that layer. The cambium of limbs which slope away from the sun does not reach as high temperatures in strong sunlight as the cambium of limbs with the surface at right angles to the sun's rays. Consequently, killing from sun scald is observed most often on those surfaces which are exposed at right angles to the sun's rays. . . .

"The time required for the cambium to thaw out in the sunshine and to freeze again when shaded was measured under a variety of conditions. A surprisingly small lag is shown by the cambium. . . . Every cloud obscuring the sun for a few minutes will cause the bark to freeze if the air temperature is sufficiently low. As soon as the cloud passes, the cambium then may warm up above its melting within two or three minutes. . . . In thick bark the cambium shows a greater lag than in thin bark; consequently the thick bark of the trunk does not freeze and thaw as often as the cambium of small limbs. . . . The green wood lying deeper in the trunk has a considerable lag owing to slow conduction of the heat and to its higher heat capacity. The wood at a depth of 1 in. does not show alternate freezing and thawing under shadows of short duration. The sapwood of large limbs is not subjected to the fluctuations shown by small limbs on account of its greater lag of temperature."

Relation of the color of bark to the temperature of the cambium in winter, R. B. Harvey (*Ecology, 4 (1923), No. 4, pp. 391–394, figs. 2*).—Measurements employing the thermocouple method reported in the paper above noted were made of the cambial temperatures of such trees as white birch, yellow willow, red osier, and black plum. The relation of the color of the absorbing surface to temperature indicates that there are important differences which may be significant in regard to adaptations to extreme temperatures. From the data obtained during this investigation it appears that the heating effect of the sunshine in winter is of considerable importance for those barks of a color such that the parts of the spectrum which contain the greatest quantity of energy are absorbed. Black or brown barks absorb a considerable part of the energy of sunlight, as is shown by their relatively higher temperature therein. Green, gray, or yellow barks show absorption intermediate between the foregoing groups.

"The importance of the color of the bark for the cambial temperatures becomes greatest when the air temperature is a few degrees below freezing. Under this condition the bark of black plum or similar bark warms up above the freezing point and thaws within a short time, while white birch bark may not thaw. This leads to a continual and rapid freezing and thawing of black bark with every passing cloud, a condition associated with sun scald and related winter injuries, which may not be experienced by trees with white bark, or bark which reflects the red end of the spectrum."

Tropism and growth [trans. title], V. J. KONINGSBERGER (*Rec. Trav. Bot. Néerland., 19 (1922), No. 1, pp. 136, pls. 3, figs. 18*).—A method is described in connection with its alleged advantages for securing the automatic registration of growth, and the growth history and behavior of Avena in relation with several influencing agents or conditions are recorded.

The vitamins and their relation to animal and plant nutrition, A. B. MACALLUM (*Sci. Agr., 2 (1922), No. 12, pp. 400–404*).—This is said to be an abstract of two lectures delivered before the Canadian Society of Technical Agriculturists.

Cyanophoric plants of the Makiling region, D. A. HERBERT (*Philippine Agr., 11 (1922), No. 1, pp. 11–16*).—A list is given of plants examined in the Makiling region, the majority of which are said to have proved to be cyanophoric in greater or lesser degree.

Additional cyanophoric plants of the Makiling region, J. B. JULIANO (*Philippine Agr., 11 (1923), No. 7, pp. 231, 232*).—"The list of plants herewith presented is by no means a thorough study of all cyanophoric plants in this locality but is rather an addition to [that noted above]. Only grasses, weeds, as well as some ornamental and food plants were dealt with."

Grossularia echinella, a spiny-fruited gooseberry from Florida, F. V. COVILLE (*Jour. Agr. Research* [*U. S*], *28 (1924), No. 1, pp. 71–74, pl. 1*).—A technical description is given of *G. echinella* n. sp., together with notes on its relationships and distribution.

GENETICS.

The improvement of field crops, with special reference to the use of the diallel crossing method [trans. title], ERHARD-FREDERIKSEN (*Tidsskr. Landøkonomi, No. 7 (1924), pp. 357–403, pl. 1, figs. 5*).—This article reviews briefly the basic principles of plant breeding and discusses at some length the work with self- and cross-pollinated plant material, especially as related to the improvement of sugar beets. The diallel method of crossing is described, and the author's application of it in field crop improvement work is pointed out.

Pistillody in wheat flowers, C. E. LEIGHTY and W. J. SANDO (*Jour. Heredity, 15 (1924), No. 6, pp. 263–268, figs. 2*).—Numerous abnormal flowers were observed in 1923 in several plants of a variety of common wheat from Argentina growing in the greenhouse at Arlington Experimental Farm, Virginia. The malformations described and illustrated in this article involved a transformation of stamens either into carpels or into structures which were partly stamens and partly carpels. In some cases only one stamen was affected, in others two, and at times all three of the stamens were either partially or completely metamorphosed into carpels. Completely transformed stamens, referred to as extra carpels, occupied the same position in a wheat flower as the stamens which they replaced.

Besides differences in the degree of transformation in different flowers, the percentage of the flowers in which abnormalities occurred varied in the several heads concerned. Nearly all of the abnormalities occurred in the two lowest flowers of the spikelets. The flowers having all of the stamens completely metamorphosed usually produced no seed, such failure being attributed to the absence of pollen-producing organs in these flowers. In several instances where a single seed was obtained from such flowers, being produced by the central carpel, fertilization doubtless had been effected by pollen from near-by normal flowers. Plants grown in 1924 from seed produced by the plants showing these abnormalities produced only normal flowers, making it seem that this abnormality of wheat flowers is not hereditary but apparently due to some unknown environmental cause operative in 1923 but not in 1924.

In the spring of 1924, J. W. Taylor found partially metamorphosed anthers similar to those described by Anthony (E. S. R., 40, p. 39) in three wheat-like plants of a nearly sterile strain of wheat and rye parentage. The authors also observed similarly modified anthers in a few heads of a wheat plant from seed from China and in one from Australian seed.

The chromosome complexes in the somatic cells of male and female of the domestic chicken, P. J. Shiwago (*Science, 60 (1924), No. 1541, pp. 45, 46, figs. 2*).—This is a more specific account of cytological studies with fowls previously referred to in the report of the Institute of Experimental Biology at Moscow (E. S. R., 51, p. 524). Frequent reference is made to the work of Stevens (E. S. R., 51, p. 228), with which the results are mainly in agreement.

The development of egg-fragments, T. H. Morgan (*Sci. Mo., 18 (1924), No. 6, pp. 561–579, figs. 15*).—The development of egg fragments in lower animal forms is described. The delicacy of such embryos and haploid embryos produced by eggs stimulated to development by chemicals seems to be due to a maladjustment between the amounts of nucleoplasm and cytoplasm.

Inheritance in Nicotiana tabacum.—I, A report on the results of crossing certain varieties, W. A. Setchell, T. H. Goodspeed, and R. E. Clausen (*Calif. Univ. Pubs., Bot., 5 (1923), No. 17, pp. 457–582, pls. 8, figs. 25*).—This contribution from the University of California is an illustrated account of a detailed study of Mendelian differences among a typical set of varieties of *N. tabacum*, a preliminary report of which has been noted (E. S. R., 47, p. 29).

Studies of three intervarietal crosses in *N. tabacum* demonstrated that all the differences between varieties of *N. tabacum* can be analyzed, with proper methods, in a Mendelian fashion. Stable recombinations of parental characters can be obtained readily with three or four generations of self-fertilization. Characters outside the range between the parents are produced sometimes following hybridization, and these may be readily established in stable lines by self-fertilization.

The petioled leaf base of *N. tabacum angustifolia* and the sessile leaf base of *N. tabacum macrophylla* appeared to differ in at least three pairs of factors. A single factor difference was found to exist between normal and split hose-in-hose flowers. Two pairs of factors suffice to account for the relation existing between red, light pink, and white flower color, while a third pair of factors seems necessary to account for dark red.

On the theoretical side, the authors have pointed out that derivation of relationships and erection of systems of classification after the manner of Comes and Anastasia can not be relied upon unless supported by experimental evidence. An adequate scheme of classification should be based upon identities and dissimilarities in the genotypes, irrespective of the derivation of the forms in question. Mendelian analysis in *N. tabacum* requires that special attention be paid to residual portions of the genotype, so that the factor differences under consideration act in a stable residuum most favorable for emphasis of the character differences under investigation.

Inheritance in Nicotiana tabacum.—II, On the existence of genetically distinct red-flowering varieties, R. E. Clausen and T. H. Goodspeed (*Amer. Nat., 55 (1921), No. 639, pp. 328–334*).—The flower color of *N. tabacum macrophylla*, red recessive to pink, although similar in appearance, was shown to be genetically different from the carmine, dominant to pink, of *N. tabacum purpurea.* The data seemed in agreement with those presented by Allard (E. S. R., 40, p. 442) for carmine v. pink and white, and supported the conclusion that his carmine variety is identical in its main genetic flower color factors with that of the authors. Considering these results, evidently any taxonomic system proposing to portray the phylogenetic affinities of the polymorphic assemblage of varieties of *N. tabacum* must be derived from genetic studies of character differences.

Inheritance in Nicotiana tabacum.—III, The occurrence of two natural periclinal chimeras, R. E. Clausen and T. H. Goodspeed (*Genetics, 8 (1923), No. 2, pp. 97–105, pl. 1*).—Two bud variants observed in F_1 hybrids of *N. tabacum* at the California Experiment Station (E. S. R., 47, p. 635) are discussed in greater detail.

The genetic evidence indicated that the change involved in the production of the bud variants had not affected the hypodermal layer, which produces the ovules and pollen grains, and histological studies with the pink bud variant upheld the view that the change had occurred in the dermatogen only. The coloring matter seems to be confined exclusively to the large, polyhedrous cells of the epidermis, and the filament-like cells of the interior are entirely devoid of pigment. Behavior of plants from root cuttings supported the assumption that the pink bud variant consists of a central cylinder of carmine of normal genetic constitution inclosed in a dermatogen which is genetically pink, and that the carmine portions of the plants are homogeneously of the normal genetic constitution of F_1 throughout.

Inheritance in Nicotiana tabacum.—IV, The trisomic character, "enlarged," R. E. Clausen and T. H. Goodspeed (*Genetics, 9 (1924), No. 2, pp. 181–197*).—Enlarged is characterized by an increase in flower size, the corolla in enlarged plants being about 8 mm. longer than in normal plants of the same population and the spread being increased about 5 mm., but the differences depend somewhat upon the particular population. Aside from the increase in flower size, no important differences are apparent between normal and enlarged plants.

Enlarged, a trisomic character depending on the presence of an extra chromosome, on self-fertilization produces about 41 per cent of enlarged and 59 per cent of normal plants and an occasional superenlarged individual. Normal segregants from enlarged breed true for the normal condition. About 35.5 per cent of the functional ovules of enlarged plants and, under normal conditions of pollination, about 3.4 per cent of the pollen grains of enlarged plants transmit the enlarged character.

Genetic evidence indicates that superenlarged is the tetrasomic condition corresponding to enlarged. Although self-fertilization of superenlarged gives erratic results, on the average 20 per cent of the progeny are superenlarged, 77 per cent enlarged, and 3 per cent normal. About 94 per cent of ovules of superenlarged transmit the enlarged character and 6 per cent the normal, and about 52 per cent of the pollen grains transmit the enlarged condition and 48 per cent the normal. These results appear to be incompatible with the idea that permanent increase in chromosome number may result from nondisjunction.

Inheritance in Nicotiana tabacum.—V, The occurrence of haploid plants in interspecific progenies, R. E. Clausen and M. C. Mann (*Natl. Acad. Sci. Proc., 10 (1924), No. 4, pp. 121–124*).—Plants that were reduced replicas of their immediate *N. tabacum* parents appeared in two F_1 progenies of *N. tabacum*×*N. sylvestris.* As a rule this cross gives a uniform, vigorous, nearly completely sterile F_1 hybrid, which is a replica on an enlarged scale of its particular *N. tabacum* parent. Since the chromosome number in *N. tabacum* is 24 and in *N. sylvestris* 12, the exceptional plants were evidently tabacum haploids, as each had 24 chromosomes. The pollen in both plants seemed to be completely defective.

The haploid tobaccos are said to resemble the haploid Daturas, described by Blakeslee et al. (E. S. R., 47, p. 822), in the random assortment of whole chromosomes at the first division, the formation of two pollen cells as a result of the division of certain pollen mother cells, and in the high percentage of bad pollen produced. The appearance of an occasional haploid plant may account for the production in some cases of sterile, maternal plants in addition to true hybrids in interspecific F_1 progenies.

Heritable characters of maize.—XVIII, Miniature germ, J. B. Wentz (*Jour. Heredity, 15 (1924), No. 6, pp. 269-272, figs. 3*).—Continuing the series noted (E. S. R., 51, p. 335), an ear of corn bearing a type of kernel characterized by very small germinal areas and embryos was found among ears segregating for germless kernels, at Iowa State College. Germination ranged from 4 to 36 per cent and the plants were weak at first, but when produced in the greenhouse and transplanted to the field they eventually developed into normally mature plants. Miniature germ appears to be inherited as a simple Mendelian recessive.

The correlation between time of germination, maturity, and yield of corn, T. B. Hutcheson and T. K. Wolfe (*Jour. Amer. Soc. Agron., 16 (1924), No. 8, pp. 483-485*).—An investigation of the relation between time of germination and maturity and yield of corn and between yield and maturity, made at the Virginia Experiment Station, gave indications that ears which germinate early produce plants which ripen late, and that the plants which tassel and silk early mature late and yield high.

Heredity in goldfish.—A note on the inheritance of dove-tails and telescope-eyes in goldfish, R. T. Hance (*Jour. Heredity, 15 (1924), No. 4, pp. 177-182; figs. 5*).—This preliminary account of studies at the University of Pennsylvania, deals mainly with the character differences and the difficulties encountered in genetic work with goldfish.

Hybrid vigor in soybeans, J. B. Wentz and R. T. Stewart (*Jour. Amer. Soc. Agron., 16 (1924), No. 8, pp. 534-540, fig. 1*).—Measurement of plant height and determination of yield of beans at Iowa State College gave evidence of heterosis in a number of F_1 hybrids between soybean varieties as compared with parents. Very little evidence of hybrid vigor was apparent in the first 6 of the 14 weeks of the growing period, the gain in height where there were distinct indications of heterosis being practically all made within the three weeks just previous to cessation of growth. The yields per plant showed the existence of heterosis very strikingly, percentage increases of hybrids over parents ranging from 59.58 to 394.37.

A report of a histological study of the eyes and gonads of mice treated with a light dosage of X-rays, L. H. Snyder, M. Schneider, and C. C. Little (*Amer. Nat., 58 (1924), No. 657, pp. 383, 384*).—The results of a study of the effect of X-raying the entire body of 60 adult mice at the Memorial Hospital in New York City are reported in relation to the effect on the gonads and eyes of the mice. The X-raying was done at a distance of 13 in., with a strength of 10 milliamperes for 12 seconds. The treatment was repeated for five successive days.

Beginning two days after the last treatment, 3 mice were killed daily and the eyes and gonads fixed and sectioned for microscopical study. No changes were detected in the testicles of the male mice or in the ovaries of the female mice, sperms and ova being actively formed in each case, nor were any changes observed in the eyes. It is thus concluded that the effect of X-rays on the offspring can not be due to the inheritance of acquired character, but rather due to the direct effect of the rays upon the germ plasm of the embryos unless the effect is of such a minute nature that it could not be detected in the parents.

On the cause of twinning and abnormal development in birds, O. Riddle (*Amer. Jour. Anat., 32 (1923), No. 2, pp. 199–252, fig. 1*).—A study has been made of the conditions surrounding the occurrence of eight cases of twin embryos in approximately 20,000 dove and pigeon eggs incubated under closely observed conditions at the Carnegie Station for Experimental Evolution at Cold Spring Harbor, N. Y. At the time of leaving the ovary, the evidence indicated that five of the ova forming the twins were abnormally large, while three were unusually small. Three pairs of the twins, of which the sex was established as females, were from large-sized ova. In testing the factors tending to influence the twinning of the pigeon and dove eggs, over 200 eggs laid up to 24 hours before the normal time and held at various temperatures before hatching gave no evidence of the production of double embryos.

As a result of these studies the author concludes "that in all probability none of the cases of twins described in the previous section was a result of premature laying, nor of delayed ovulation, with a consequent cooling of the pregastrulation blastoderm. Two further conclusions of importance follow: First, the twinning which occurred was related in some way to the highly abnormal size of the yolks from which they arose, i. e., to a condition already present in the ovarian egg. Second, the fact that the three pairs of twins of known sex were females and that they all arose from yolks of extremely large size supplies an unexpected and unique bit of evidence in harmony with other data obtained by us—all of which indicates that in pigeons there is a correlation between large yolk size and femaleness on the one hand and small yolk size and maleness on the other."

The treatments of embryos in various stages of development varying from 3 minutes to 13 days of age in 70 experiments, with about 25 eggs in each experiment, indicated that increased amounts of oxygen and carbon dioxid produced a large percentage of abnormal embryos. Increased and decreased oxygen supplies, respectively, also produced abnormal embryos, but in smaller numbers. Cooling seemed to have the least influence in the production of abnormalities. Due to a high incubation temperature, the monsters occurring in a low oxygen atmosphere are thought to be due to the higher temperature rather than to the lack of oyxgen. As to the time of the treatments, it was found that those tending to bring on abnormalities occurred in nearly all cases when the embryos were less than 2 days old. At certain stages less resistance to changes in the temperature was evident, and at other ages changes in the oxygen or CO_2 supply were most likely to cause abnormal development.

The author finally concludes that alterations in the developmental rate or perhaps the metabolic rate at critical stages in development are responsible for both abnormalities and twins. The twin-forming ova of large size gave evidence of the existence of a slow metabolic rate, while those of small size indicated a high metabolic rate at the time of discharge from the ovary.

FIELD CROPS.

[Field crops work in Idaho, 1923] (*Idaho Sta. Bul. 133 (1924), pp. 15–17*).—In further experiments (E. S. R., 49, p. 732) at the High Altitude Substation, winter wheat gave best results from seedings on September 1 and at a 4-pk. rate. Deep plantings have given a small increase over other seedings. The highest yielding varieties included Victory oats; Trebi barley; Carlton, Bliss Everbearing, and Wellwood field peas; Jenkins Club, Little Club, Bluestem, and Marquis spring wheat; and Kharkof, Triplet, Turkey, and Kanred winter wheat. Slender wheat grass was promising among the grasses.

Early seeding was beneficial with both winter and spring wheat at the Sandpoint Substation. Culti-packing spring wheat resulted in an increased yield. Seeding 90 lbs. of peas with 70 lbs. of oats made the highest yields of such combinations.

Broadcasting alfalfa and red clover seed without a nurse crop proved superior to other methods of seeding. With proper tillage methods, satisfactory stands of alfalfa and sweet clover can be obtained from seedings made as late as July. Poor results followed seeding on the snow or on honeycombed ground or in the fall. With applications of gypsum and of lime the yield of perennial legumes was increased by about 50 and 25 per cent, respectively, while with phosphate there were only slight increases.

The maximum production of sunflowers was obtained on plantings made April 27 and at 18-in. spacing. Corn produced less than one-third as much as sunflowers for silage. Idaho Rural and Irish Cobbler potatoes were the highest yielding of the late and early varieties, respectively. Heavier seeding produced a greater total yield and whole seed outyielded cut seed.

Crop experiments (*Indiana Sta. Rpt. 1923, pp. 51–53*).—Based on the average acre yields in tests and average Indiana farm prices during the period 1910–1922, the percentage returns, considering winter wheat at 100, were winter rye 95, spring oats 60, spring rye 55, winter barley 51, spring barley 48, and spring wheat 35. Michigan Amber and Stoner wheats made their best yields when drilled solid at the rates of 7 and 6 pk. per acre, respectively. Experiments with Sudan grass indicate, for maximum yields of hay and seed, drilling solid 32 lbs. of seed per acre about June 1. Native clovers were far more winter-resistant than exotic strains.

[Field crops work in Louisiana, 1923], W. G. TAGGART, A. F. KIDDER, G. L. TIEBOUT, S. STEWART, J. M. JENKINS, ET AL. (*Louisiana Stas. Rpt. 1923, pp. 7, 8, 18, 19, 26, 27, 35–41, 44, 46–48*).—Sodium nitrate and ammonium nitrate gave the best results of the nitrogenous materials applied to sugar cane at the Sugar Experiment Station (E. S. R., 49, p. 824). The merits of melilotus were again evident on fall plant cane and on the stubble crop.

Varietal leaders at Baton Rouge included Cleveland, Trice, Mexican Big Boll, Alex Wilt Resistant, and Dixie Triumph cotton; Express and Delfos 6102 long staple cotton; Patterson oats; Biloxi and Mammoth Yellow soy beans for seed, Ebony for hogging down, and Otootan, Barchet, Laredo, and Virginia for hay; and Osceola velvet beans. Red clover from foreign sources was only slightly mildewed, while strains grown in the United States were badly affected. Certified Triumph seed potatoes from Nebraska and Wisconsin proved decidedly superior to ordinary commercial seed. In 1923 the certified seed gave over 61 per cent more yield and had only a fractional amount of the mosaic found in uncertified stock.

Experiments at the North Louisiana Station included variety tests with cotton, corn, velvet beans, and soy beans; rotations; and studies of place effect in cotton varieties.

Acadia rice produced the highest yields at the Rice Experiment Station. Fertilizer experiments have shown that no commercial fertilizer can be relied upon to sufficiently increase or maintain the yield of rice on land similar to that of the station. Although certain elements alone and in combination increased the yield, the increase was in no case sufficient to pay for the cost of application. The yields of rice obtained after a crop of soy beans in 1922 were far in excess of those secured from commercial fertilizer or from fallow land. Culture of soy beans has controlled weeds, especially red rice, and hardly half the work was needed to obtain a good seed bed after soy beans as after rice.

[Report of field crops work in Nebraska] (*Nebraska Sta. Rpt. [1923], pp. 13–17, 34–38*).—Experiments with field crops are reported on as heretofore (E. S. R., 49, p. 732).

Hybridization of self-fertilized lines appeared to be the most promising method of corn improvement. Certain pure line F_1 hybrids showed superiority over the original corn, but new hybrid seed must be produced annually rather than selection from the hybrid progeny. Root rots did not appear to be serious in Nebraska, and if seed of satisfactory viability is selected apparently nothing is to be gained by germinator testing for disease. The question of regional adaptation, involved in all such tests, is regarded as the outstanding factor in productivity. Transpiration data in water requirement studies with corn suggest that soil treatments resulting in more favorable plant development tend to increase the dry matter produced per unit of water transpired.

The leading early varieties of oats have averaged 54 bu. during 18 years and of late oats 45.3 bu. The most productive varieties of spring and winter wheat and the relative yields of Sudan grass and Amber sorgo in seeding and harvesting tests are shown. Rate of planting tests indicate that the planting rate with any of the small grain crops may vary widely without a material effect upon yield. Although sorghum varieties did not differ much in forage production, Amber sorgo has considerably outyielded Sudan grass.

Rotations at the North Platte Substation including manure and sod crops averaged 53.5 bu. of corn per acre during 1923, while rotations omitting manure and sod crops made 44.4 bu. The average acre yield of five early varieties of oats was 74.7 bu. as compared with 50.6 bu. from three late varieties. Oats on fall plowing produced considerable more grain than oats on spring plowing. The soft varieties of corn led by Red Flour yielded about 5 bu. per acre more than dent varieties. Maximum yields in date of seeding tests with wheat, oats, barley, and rye were obtained from plantings made April 9.

Sorgos averaged 565 lbs. more forage per acre than grain sorghums at the Valentine Substation. Sudan grass produced about one-half the forage yield of the sorgos and about two-thirds that of corn. Planting in cultivated rows gave a slight increase over drilling. The relative yields of silage crops, grain crops, millets, and annual legumes are also given.

Rotations at the Scottsbluff Substation containing alfalfa, sweet clover, or manure have been profitable as an average for 12 years, while rotations omitting these have been unprofitable. Commercial fertilizers did not influence yield materially, indicating that the enhanced yields resulted from the increased organic and nitrogen content of the soil. Tame grass pasture receiving 10 and 20 tons of manure per acre annually had twice the carrying capacity of unmanured pasture.

[Field crops experiments in North Carolina, 1922–23], C. B. Williams and C. D. Matthews (*North Carolina Sta. Rpt. 1923, pp. 26, 27, 43–46, 55–57, 88, fig. 1*).—Investigations with different field crops are reported on in continuation of earlier work (E. S. R., 49, p. 733).

In experiments with tobacco in progress at Oxford in cooperation with the U. S. Department of Agriculture, when magnesia, derived from either dolomitic limestone or double manure salts and kainit, was applied fairly liberally, sand-drown was not prevalent except on unlimed double manure salts plats where calcite was applied. On these plats a small percentage of the plants developed symptoms of sand-drown, indicating that not enough magnesia was available to mature the large growth of the leaf developed during the season. Where calcite was applied sand-drown was worse this year than where no lime was used, indicating that the use of calcium alone seemed to hasten the exhaustion of the magnesia supply of these soils somewhat similar in effect to that shown by exhaustion of the potash supply. Cottonseed meal, sodium nitrate, dried blood, and ammonium sulphate ranked in order as individual sources of nitrogen, although a mixture of one-fourth of each of these materials gave satisfactory results. Acid phosphate gave the best results of the sources of phosphorus. Potassium chlorid produced more and better tobacco than high grade potassium sulphate, although all tests have shown tobacco produced with the latter salt to have a better burning quality. Fairly liberal applications of potash appear essential for the most profitable growth of tobacco. While tobacco after cowpeas has been fairly satisfactory, tobacco must be planted close, topped high, and harvested by priming for best results from such cropping. Otherwise an excessive amount of nitrogen will produce tobacco of poor quality.

A method for determining rapidly the density of fiber population on the cottonseed coat, employing a sharpened leather punch for cutting out a section of the seed coat and then counting the fibers, has been very satisfactory. It is claimed to be much superior to methods previously recommended, in which the area of the seed must be determined. Close spacing of cotton has yielded highest although furnishing a slightly shorter staple.

Comment is made on the behavior of subterranean clover, serradella, Alabama Bluestem wheat, and varieties of the mungo bean. The progress of breeding work with Honey sorgo and pure lines and hybrids of soy beans is briefly described.

Elevations over 2,500 ft. appear to be satisfactory for growing desirable seed potatoes for eastern North Carolina.

[Field crops investigations in North Dakota, 1921–1923], H. L. WALSTER, H. L. BOLLEY, and T. H. HOPPER (*North Dakota Sta. Bul. 174* (*1924*), *pp. 5–15, 28, 29, 30, 31, 41, 42, figs. 2*).—These pages report the progress of experiments noted earlier (E. S. R., 48, p. 29) and describe varietal tests with soy beans and corn; seeding tests with winter wheat and rye; breeding work with alfalfa, corn, wheat, and flax; and analyses of corn varieties, grasses, and mangels. Investigations with flax have been already noted at length (E. S. R., 51, p. 437).

In rotations on unmanured land wheat averaged 17.7 bu. per acre and where manure was used once in the rotation, 20.1 bu. Crop residues were as effective in maintaining wheat yields in 4-year rotations as was manure. The best wheat yields were obtained after red clover, whereas yields after German millet were distinctly poor as compared to better crop sequences. Hard red spring and durum wheats averaged 14.6 and 21.6 bu. per acre, respectively, after sunflowers and 16.5 and 26 bu. after potatoes. In a rotation of red clover, wheat, corn, and barley, wheat benefited most from the legume, barley somewhat, and corn but little as compared with a rotation replacing the clover with timothy. When these rotations were manured, the percentage increases due to manure were much greater in the nonlegume rotation.

During most of the period 1914–1921, manured alfalfa produced 3.62 tons of hay per acre, and unmanured alfalfa 3.63, indicating that as far as the heavy clay soil at Fargo is concerned, top-dressing semipermanent fields of alfalfa with rotted manure is not profitable. During 7 comparable years, unmanured alfalfa has produced 50 per cent more hay than manured brome grass land. During 16 years brome grass manured yielded 2.72 tons of hay per acre and unmanured, 1.61 tons. The fodder yields of sunflowers do not recommend them where corn produces well.

[Agronomic experiments at the Dickinson, Edgeley, Hettinger, Langdon, and Williston, North Dakota, Substations, 1921–1923], L. MOOMAW, O. A. THOMPSON, U. J. DOWNEY, L. JORGENSON, and A. C. KUENNING (*North Dakota Sta. Bul. 174 (1924), pp. 74–76, 79–81, 82, 83, 84, 85, 86–89, 90–95, figs. 2*).—Projects reported on in continuation of earlier work (E. S. R., 44, p. 524; 45, p. 734; 48, pp. 30, 224) include variety tests with durum and common wheat, oats, barley, corn, millets, flax, field peas, alfalfa, potatoes, sugar beets, rutabagas, carrots, and mangels; seeding experiments with wheat, oats, field peas, and potatoes, and corn and sunflowers for silage; effects of crop sequences on yields; rotations on dry land and under irrigation; and tillage experiments.

[Field crops work in Porto Rico in 1923], T. B. MCCLELLAND, T. BREGGER, W. P. SNYDER, and J. A. SALDAÑA (*Porto Rico Sta. Rpt. 1923, pp. 5, 6, 7, 8–10, 11, figs. 2*).—In further investigations (E. S. R., 50, p. 533) with cover crops, *Crotalaria juncea* gave the most satisfaction of the several species of Crotalaria grown, making a vigorous and rapid growth and smothering encroaching weeds. A study of the photoperiodism of *Tephrosia candida* showed that a range of 2.2 hours in local day length suffices to determine the blooming season and to modify decidedly the growth of the plant.

Madeira and Key West led the varieties of sweet potatoes in production. Yams with staked vines yielded twice as much as those with unstaked vines grown on equal areas. Although yautias and taros planted 18 by 36 in. yielded 26.7 and 12.5 per cent, respectively, more than when spaced 36 by 36 in., twice as much seed is required in the narrow spacing and the free use of an animal-drawn cultivator is hindered.

The progress of breeding work with corn, sweet corn, rice, beans, soy beans, cowpeas, and velvet beans is briefly reviewed.

E. K. 28 and an unknown sort from Java, resembling Uba, were promising among the newly introduced sugar canes. Bud selection experiments with the P. O. J. 36 and Uba varieties gave negative results. In efforts to induce seed to germinate beneficial results were obtained where seed boxes were covered with glass or where sterilized soil was used. Few seed germinated, however, where subsurface irrigation was practiced.

Pot experiments under glass with wheat gave results seeming to indicate that the yield is reduced by planting too deep or in a trench which is filled in with soil during growth, insufficient water supply (about 0.6 in. per week), withholding water from the crop after about 10 days after heading, and failure to use fertilizer. Clipping the young plants gave conflicting results. Mulching with cane trash increased the yield, regardless of whether the plants were watered at the rate of 0.6 or 0.9 in. per week. Adding lime to the fertilizer, withholding potash, or varying the amount of nitrogen did not affect the yield appreciably.

Agronomic investigations [in the Virgin Islands, 1923], J. B. THOMPSON (*Virgin Islands Sta. Rpt. 1923, pp. 2–4, pl. 1*).—Breeding work with corn, sweet potatoes, and sugar cane, a fertilizer test with sweet potato varieties, and comparisons of varieties of alfalfa, cowpeas, and velvet beans are briefly described in continuation of earlier work (E. S. R., 50, p. 533).

Cereals and milling, C. E. Mangels (*North Dakota Sta. Bul. 174* (*1924*), *pp. 37–40, figs. 2*).—The baking quality of hard red spring wheat from the 1921 and 1922 crops remained fairly stable during storage, while 1921 durum showed a considerable change during the first eight months. The 1922 durum samples were more stable than those from the 1921 crop. When stored as flour in a warm room the durum tended to deteriorate more than the hard red spring samples.

Macaroni from Kubanka, Arnautka, and Mindum stood up well when cooked and had the desirable creamy color, whereas the color of Acme, Monad, and red durum was unsatisfactory. Durum wheats are inferior to hard red spring wheats for bread purposes because of smaller loaf volume, poor texture, variable baking quality, and creamy or yellow flour. Marquis excelled Power Fife, Bluestem, Preston, Red Bobs, and Kitchener for bread making, while Ruby compared favorably with Marquis. Except that the flour and bread from Kota show a tendency to be creamy in color, baking tests with this variety have been generally favorable. Data from a survey of the 1922 crop taken together with results on the rotation plats at Fargo suggest that cropping systems and soil fertility may at least equal climatic conditions in importance as a factor influencing the protein content of wheat.

Effect of storage on baking quality of common and durum wheats, C. E. Mangels (*Cereal Chem.*, *1* (*1924*), *No. 4, pp. 168–178*).—The storage studies with wheat reported above are described in greater detail.

Summer annuals for hay in Connecticut, B. A. Brown (*Connecticut Storrs Sta. Bul. 120* (*1924*), *pp. 155–172, figs. 2*).—Varieties of millet and of soy beans, Sudan grass alone, and Sudan grass and Japanese millet with soy bean varieties were compared as to their value for annual hay crops. Analyses of the crops and mixtures, and the acre yields of hay, green forage, and of their several components are tabulated.

Japanese millet seeded alone produced about 10 per cent more hay than any of the other crops or mixtures. Millets were easier to cure than the mixtures and the soy beans. Soy beans produced 2.33 times as much protein per acre as Japanese millet, the best of the nonlegumes in this respect. They had a lower percentage of fiber than the millets, and the soy bean hay seemed to be more palatable than millet. Sudan grass yielded less than Japanese millet and, of all crops tested, contained the least protein per acre. The yields of the mixtures were usually between the yields of the two component varieties seeded alone. In contrasting the merits of soy beans and millet, the author feels that soy beans should be considered seriously in choosing a summer annual hay crop.

Edible canna in Hawaii, H. L. Chung and J. C. Ripperton (*Hawaii Sta. Bul. 54* (*1924*), *pp. 16, pls. 2, figs. 4*).—The botanical characteristics, soil and climatic requirements, cultural methods, pests, composition, feeding value, and uses of edible canna (*Canna edulis*) are set forth, together with a summary of experiments with the crop at the station (E. S. R., 51, p. 740).

Potato sprouts as an index of seed value, C. O. Appleman (*Maryland Sta. Bul. 265* (*1924*), *pp. 237–258, figs. 10*).—Apical dominance in potatoes is regarded as the inhibiting influence of the terminal sprouts on the growth of sprouts from the other eyes of the tuber. The cause of apical dominance seems to be inherent in the tuber, but it may be partially counteracted by external conditions. According to data presented in this bulletin the degree of apical dominance in the growth of the first crop of sprouts may be employed, under certain conditions, as a simple and practical means of detecting and eliminating weak tubers in the seed stock.

Storage of McCormick potatoes for six months at 33 to 34° F. resulted in a reduction of sprout vigor and in degree of apical dominance. A year of such storage resulted in very weak sprout growth and destruction of apical dominance. Photographs illustrate the direct relationship between the size of the seed piece, the vigor of the sprouts, and the vigor of the plants produced from the sprouts. Irish Cobbler tubers with (1) one vigorous terminal sprout, (2) sprouts intermediate in vigor and scattered over the tuber, and (3) with spindling sprouts emerging from nearly every eye, planted whole after sprouts were removed, yielded 14, 14.2, and 7.7 oz. per hill, respectively. The second and third groups produced much larger percentages of No. 2 tubers and culls than the first lot.

McCormick potatoes were planted at uniform depths in damp sawdust and the sprouts removed several times when from 1.5 to 2 in. long. Apical dominance was very pronounced in the first crop of sprouts, the very large tubers (11 oz.) producing only two or three sprouts and the medium (6 oz.) and small tubers (3 oz.) one sprout each. With each succeeding crop the number of sprouts increased irregularly until a rather sudden burst of sprouts took place over the entire tuber. After this occurred the tubers failed to produce another crop of true sprouts, but instead gave rise to a number of small tubers in a manner very similar to that frequent in severe cases of spindling sprout disease. At the time the tubers lost their capacity to produce sprouts, only about 8 per cent of the initial total solids in the tubers had been removed by the sprout growth, although something in the tubers, essential for sprout growth, had been exhausted. After the first two crops of sprouts were removed the index of sprout vigor (the average weight of sprouts in grams divided by the average length in centimeters) remained fairly constant for the next four crops and then declined suddenly with the increase in the number of sprouts.

The foregoing results considered with yield tests suggest that at least four crops of sprouts 2 or 3 in. long may be removed from McCormick potatoes in storage without materially affecting their seed value when the tubers are cut before planting, but if the tubers are planted whole they may produce too many stalks per hill because of the apical dominance being weakened by repeated sprouting. Irish Cobblers appear to be weakened by repeated sprouting somewhat sooner than McCormick potatoes. Under proper conditions of common storage it is usually unnecessary and unwise to remove the sprouts before planting, as the number of sprouts will increase greatly in the next crop.

Spacing of potato hills, B. A. BROWN (*Connecticut Storrs Sta. Bul. 119* (*1924*), *pp. 143–151*).—Irish Cobbler, Green Mountain, and Rural Russet potatoes were planted in 3-ft. rows with hills ranging from 6 to 23 in. apart.

In practically every test the total yields increased and the percentages of No. 1 tubers decreased as the distance between hills was reduced. Net returns from the 9- and 12-in. spacings were larger than from the other distances for all varieties in each of the three years of the tests. The net returns from the 9-in. spacing with Irish Cobblers were larger than from the 12-in. in two of the years, averaging $16.78 more per acre. Since the net returns from the 9- and 12-in. spacings with Green Mountain and Rural Russet were not significantly different and because of the lower value of the No. 2 tubers, 12-in. spacing appears advisable for average conditions.

Investigational and experimental work on sugar cane, P. R. KUNTZ (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt.*, (*1923*), *pp. 35–37; also in Spanish ed., pp. 35–37*).—In tests in different districts in the island the sugar cane varieties B. H. 10(12), L. 511, St. Croix 12(4), and B. 3696 were characterized by high percentage of sucrose, good purity, early maturity, and fair resistance to prevailing diseases. P. R. 433 appeared of promise among the Porto Rican varieties tested.

Farm seed survey, H. L. Walster (*North Dakota Sta. Bul. 174 (1924), p. 15*).—A survey of the quality of the seed sown on many farms in North Dakota in 1922 disclosed the presence of kinghead in seed wheat, wild oats in seed oats, pigeon grass in flax seed, hard red spring wheat and red durum in amber durum seed, and frequent admixture of durum in common wheat seed. Cleaning devices and rotations, including cultivated and sod crops, are suggested for weed control.

Ridding the land of wild morning glory, G. Stewart and D. W. Pittman (*Utah Sta. Bul. 189 (1924), pp. 3–30, figs. 10*).—Serious infestation of agricultural land in Utah by wild morning glory (*Convolvulus* sp.) led to experiments wherein heavily infested plats were variously sprayed, tilled, and shaded. The effectiveness of the different treatments was measured by the amount of rootstocks in the soil at the end of the season, the top growth the following spring, and by the ease and success with which sugar beets were grown in the two years following treatment.

Tillage was found to be much more effective than spraying with solutions of sodium arsenite. The results indicated that frequent and preferably shallow tillage should be applied just before or immediately after top growth appears. Russian sunflowers sown as a smother crop in 20-in. rows with plants 3 or 4 in. apart were effective up to about 85 per cent, but this method is not recommended unless clean tillage is impractical. Corn drilled in 24-in. rows was ineffective as a smother crop. While pasturing with hogs destroyed about three-fourths of the stand, it is advised only as preliminary where clean tillage is impossible. Neither covering the land with 4 or 5 ft. of well rotted straw, nor shading with heavy building paper, nor yet spraying with crude oil, kerosene, gasoline, and salt brine was effective in controlling the weed.

Studies in the eradication of wild morning-glory, G. Stewart and D. W. Pittman (*Jour. Amer. Soc. Agron., 16 (1924), No. 8, pp. 506–518*).—An abridged account of the experiments noted above.

HORTICULTURE.

[Horticultural investigations at the Indiana Station] (*Indiana Sta. Rpt. 1923, pp. 34–38, figs. 2*).—This report comprises, as usual (E. S. R., 49, p. 530), brief comments on the progress of various investigational activities. At Laurel, apple trees managed on the tillage cover crop plan continued to lead others in growth and production. The application of nitrate of soda to trees mulched with straw since 1916 resulted in a marked increase in growth. Pruning investigations carried on with 6-year-old apple trees indicated that heavy pruning not only retards growth but delays the beginning of fruiting. Thinning peach fruits markedly increased the size of the remaining specimens on old trees bearing a large crop. As in the preceding season, dusting investigations at Peru showed this treatment to be less effective and more expensive than spraying for controlling apple scab. Studies indicated that the essential value of a cover crop lies in the amount of vegetable matter made available for plowing under, and that winter cover crops should be turned under as early as possible in the spring.

Variety and strain tests with tomatoes on the new station farm, though not so conclusive as in previous years, again demonstrated the superior value of station selected stocks. In separating sweet corn kernels into large and small sizes, it was found that large seed resulted in earlier and more uniformly maturing plants, of slightly higher yielding capacity. Station selected sweet corn stocks were found superior to commercial varieties in respect to yield, growth uniformity, and freedom from disease. Sweet corn fertilizer studies on a deep, fertile soil at Brookston showed the best growth and largest yield on the complete fertilizer plats. The use of 600 lbs. per acre of nitrate of soda resulted in profitable spinach yields. Water, nitrate of soda, and manure increased the yield of cauliflower plants, while phosphorus, potash, and lime proved unprofitable.

[**Horticultural investigations at the North Carolina Station**], C. D. MATTHEWS (*North Carolina Sta. Rpt. 1923, pp. 85, 86*).—Observations on the yield of individual pecan trees showed a considerable variation within single varieties, suggesting the possibility of improvement by the propagation of high yielding trees. Top working studies with the pecan indicated that a combination of grafting and budding yields satisfactory results. It is believed that top working, in order to be most successful, should be confined to trees not over 10 years of age. Cracking tests of nuts from several pecan varieties assisted materially in determining the adaptability of varieties to the State.

Pruning investigations with apples, begun at the Mountain Station in 1919, have already shown the inadvisability of severe pruning of young trees.

[**Horticultural investigations at the North Dakota Station**], A. F. YEAGER (*North Dakota Sta. Bul. 174 (1924), pp. 49–53, figs. 3*).—A brief review of activities, chiefly comprising varietal tests of a large number of vegetables, fruits, and ornamental plants.

In a storage test of squash and pumpkins, the Mammoth Cheese pumpkin kept 17 months in good condition. Tomato plants spaced 5 by 5 ft. not only outyielded similar plants spaced 1 by 5 ft. but their fruits were larger and firmer. Significant differences were noted in the popping quality of varieties of pop corn, the Golden Tom Thumb being one of the poorest and Black Beauty one of the best in this respect. Pop corn with a moisture content ranging between 10 and 14 per cent gave the most satisfactory results.

Work with the various greenhouse crops indicated the value of mushrooms as an auxiliary crop planted beneath the regular beds. The Grand Rapids forcing tomato proved very satisfactory both in productivity and in ability to self-pollinate under cloudy conditions. A selected strain of the Grand Rapids lettuce designated as Dakota Beauty and a selection of the Earliana tomato known as North Dakota Earliana were favorably received by growers. The F_4 generation of a cross in which the North Dakota Earliana was one parent has proved as early as the Earliana and bears smoother and firmer fruits.

In fruit tests it was found that Delicious and Golden Delicious apples are not hardy. The Latham raspberry gave satisfactory results. As reported on page 839, apple trees with short trunks were hardier and more productive than those with standard trunks. Mulched apple trees suffered no winterkilling injury, whereas clean-tilled trees showed 25 per cent loss.

[**Horticultural investigations at the Porto Rico Station, 1923**], T. B. MCCLELLAND, T. BREGGER, W. P. SNYDER, J. A. SALDAÑA, W. V. TOWER, and H. C. HENRICKSEN (*Porto Rico Sta. Rpt. 1923, pp. 4, 5, 6, 7, 8, 10, 11, 14, 16–18, figs. 2*).—A general review of experimental activities during the year (E. S. R., 50, p. 539).

A strain test of beans, including native, introduced, and hybrid varieties, indicated the superiority of varieties originating in the tropical zone. However, one variety from Manchuria showed considerable promise. Hybridization work with ornamental hibiscus resulted in the production of approximately 250 seedlings.

As in preceding years coconut trees fertilized with common salt led in production, yielding an average of about 69 nuts per 9-year-old tree, as compared with from 60 to 67 nuts for trees fertilized with ammonium sulphate used in combination with acid phosphate or potash or with both. Control trees averaged 36 nuts.

Fertilizer studies with coffee demonstrated the value of potash for this plant. Twenty plats receiving potash alone or in combination with other materials produced 2.75 times as much coffee as did the same number of plats differing only in the absence of potash. The superiority of ammonium sulphate over nitrate of soda as a coffee fertilizer on clay soils was shown in pot experiments in which the bushes fertilized with ammonium sulphate greatly surpassed the nitrated trees in height growth, number of leaves, weight of leaves, and in weight of trunk and branches. The nitrated trees were in fact only slightly superior to the control trees.

Observations on the F_2 generation of a cross between the native striped Pompona and the New York Improved eggplants showed the majority of the seedlings to be purple fruited and of good size. In a few cases the color of the native was combined with the size of the New York Improved.

Tomato investigations included an attempt to obtain good quality, vigorous stocks by hybridizing native and commercial varieties. In general the progeny yielded more than either parent but showed no marked superiority in wilt resistance. In some cases the bitter flavor of the native tomato was not eliminated, and in other cases the seedlings lacked the symmetry and uniformity of the commercial parents. The progeny of Globe×Mack Prolific outyielded either parent. Planted in wilt infected soil Stark Blight Resister (Norton) showed maximum resistance, only 21 per cent of the plants succumbing in 162 days.

A study of different methods of storing grapefruit for home use indicated that fruits cleansed of scale and stored in clean, moist sand or sawdust will keep for several months. The longest period of storage was 14 months, but losses usually began after 5 months. Of varieties tested, the Pernambuco was the best keeper, Marsh Seedless second, and Duncan third. It was found that grapefruit may be satisfactorily stored for short periods in dark, moist chambers.

Studies of the effect of storage temperatures on the ripening of pineapples indicated that holding at from 50 to 60° F. for one week will partly arrest maturity changes, and that a temperature of from 35 to 40° will stop maturity changes considerably whether the fruits are green or mature. Storage up to 6 days at from 35 to 40° did not interfere with the proper ripening of immature pineapples subsequent to their removal. Very little shrinkage was noted in well-packed pineapples held for from 6 to 10 days at a temperature of from 35 to 40°. Plant ripened pineapples were kept from shrinking by coating with a thin layer of paraffin, a procedure which, however, interfered with a proper coloration of immature fruits.

A study of storage temperatures in relation to the control of stem-end rots in oranges and grapefruit showed that this disease may be held in check by holding fruit at a temperature of 45°. However, subsequent to removal from storage the fruits decayed rapidly. Ocean transportation studies indicated that if precooled to 50° citrus fruits may be shipped from Porto Rico to New York City in the ventilated hold of nonrefrigerated steamers without the temperature rising much above 60°.

[Horticultural investigations at the Virgin Islands Station, 1923], W. M. Perry (*Virgin Islands Sta. Rpt. 1923, pp. 7-12, pls. 2*).—Similar to earlier reports (E. S. R., 50, p. 540), this contains yield and cultural notes on fruit and vegetable varieties. Among a number of new plant accessions received during the year were several species of Eucalyptus and Casuarina, both deemed of possible value as windbreak material. In addition several fig and grape varieties and oil and sugar producing palms were introduced.

The bush form fruit tree, A. F. Yeager (*Amer. Soc. Hort. Sci. Proc., 20 (1923), pp. 321–323*).—Investigations at the North Dakota Experiment Station indicate that bush form apple and probably other fruit trees have a positive advantage in that locality over standard trees. Of two lots of Hibernal apples, one branching at the ground and the other at 2-ft. elevation, the former lot made not only much the greater annual growth but also came into fruiting earlier. Records taken at the end of the second and third season after planting showed the bush trees to have averaged 125 and 346 in. growth, respectively, as compared with 60 and 145 in. for the standard trees. Sand cherry trees planted as standards apparently overcame injury to the original head by sending out lower limbs. Compass cherries were found better able to withstand the adverse weather conditions. In conclusion the author admits the cultural disadvantage of bush form trees but believes the increased hardiness more than offsets this handicap.

Apple growing east of the Mississippi River, H. P. Gould (*U. S. Dept. Agr., Farmers' Bul. 1360 (1924), pp. II+50, figs. 38*).—A comprehensive discussion of the principles and practices of apple production, considering in detail such points as the present distribution and extent of the industry, selection of location and site, propagation, selection of healthy and vigorous nursery stock, planting practices, systems of culture, tillage implements, fertilizers, pruning, and protection against insect, fungus, and animal pests.

Studies of physical and morphological changes in Bartlett pears, A. E. Murneek (*Amer. Jour. Bot., 10 (1923), No. 6, pp. 310–324, pl. 1, figs. 3*).—In general continuation of studies at the Oregon Experiment Station (E. S. R., 46, p. 641) upon factors concerned in the ripening of pears, the author found the following seasonal morphological and histological changes occurring in the Bartlett pear:

"There was an average increase of 93.7 per cent in size and an average decrease of 14.8 per cent in thickness of walls of cells of the cortex. Cells of the lower portion of the subepidermis increased in size (area of a longitudinal section) by 65.6 per cent, while those of the first layer beneath the epidermis increased by 39.3 per cent. Though comparatively slight, still there was a seasonal enlargement in size of epidermal cells amounting to close to 14 per cent. The cuticle covering these cells decreased in thickness at the same time by 19 per cent. The average increase in number of 'window cells' per 'mother cell' was from 2.92 to 4. Lenticels decreased during this period from 44 to 32 per square centimeter of surface area of the pear. A conspicuous alteration in form and structure of lenticels was noted. The volume occupied by starch in an average cortex cell decreased from 5.49 per cent to 1.17 per cent."

It is believed, however, that chemical alterations of the various constituents of the cell walls are also undoubtedly concerned in the softening associated with maturity. The increased turgidity of the cells of the cortex resulting from the gradual hydrolysis of starch into sugar may also contribute to the lowering of physical resistance in the cortex during the ripening season.

Studies relating to the harvesting and storage of apples and pears, H. Hartman (*Oregon Sta. Bul. 206 (1924), pp. 5–32, figs. 2*).—As a further contribution to fruit storage investigations, the author presents the results of 1923 studies with fruits grown principally in the Willamette Valley.

The relation of humidity to loss of weight in the Bartlett pear was shown when fruits stored at from 52 to 56 per cent humidity lost 13.9 per cent of their weight in 408 hours, while fruit held at the same temperature for the same time at from 80 to 86 per cent lost only 1.1 per cent of their weight. Bartlett pears picked August 14, August 29, and September 14 lost under similar storage conditions 9.7, 6.3, and 5.8 per cent of weight, respectively, showing that the immature fruit suffers the maximum loss. Pears picked August 29 and subjected to the same storage conditions except wrapping, part being unwrapped, part inclosed in common fruit tissue, and part in oiled paper, lost 7.9, 6.8, and 6.7 per cent of their weight, respectively, indicating that wrapping had no significant effect on storage shrinkage. Daily records of loss of weight in Bartletts harvested August 29 and kept at 66° F. in open containers in which the relative humidity was from 52 to 56 per cent showed the fruits to lose weight at a fairly constant and uniform rate during the 16 days observed. Determinations of the volume loss in pears picked August 14, August 29, and September 14 and stored at 66° and at a relative humidity of from 52 to 56 per cent showed losses of 14.5, 9.2, and 6.2 per cent, respectively, thus closely correlating volume with weight losses.

As indicated by pressure tests, Bartlett pears from lightly cropped trees, though larger in size, were less mature at a given date than fruit from heavily laden trees. In studies of various factors believed to affect the pressure test readings, it was found that temperature is a potent factor, Bartletts at 97° registering 31.6 lbs. as compared with 35 lbs. for fruit at 51°. The removal of the major part of the crop from pear trees resulted in a marked slowing down of the rate of loss in pressure resistance for the residue as compared with that of unpicked trees, leading to the suggestion that the pressure test is no longer an accurate indicator of maturity after part of the fruit has been picked. A slight increase in the resistance of pears subsequent to harvesting observed in certain instances is believed associated with loss in turgidity of the epidermal cells, rendering the skin leathery and tough. Fluctuations of pressure readings occurring in fruit while still attached to the trees are also believed due to turgidity relations.

Since pressure readings on pared and unpared surfaces of clear-skinned varieties of pears showed about equal variability, the author believes that nothing is gained in paring such fruits. However, in russeted and heavily blushed fruits, paring may result in greater accuracy. Pressure tests of pared and unpared Comice pears picked at nine dates between September 17 and October 19 showed a greater amount of seasonal decrease in resistance in the epidermal than in the exposed flesh, indicating that tests with unpared fruits were the more satisfactory.

Such general conditions as ripening of imperfect fruits, changes in ground color, and loss of bloom were found to be more reliable indicators of approaching maturity than were ease of separation from the spur, color of the seeds, or size. In order to study the relation of time of picking to quality and time of ripening, storage tests were conducted with representative lots of Anjou, Comice, Winter Nelis, and Bartlett pears gathered at intervals of from three to five days and subjected to the pressure test. Correlating ultimate quality with original pressure readings, it was found that ranges between 24 and 19, 20 and 18, 33 and 29, and 35 and 25 lbs. at the time of harvest were satisfactory maturity indicators for the respective varieties.

Among miscellaneous observations, it was found that the total crop of Bartlett pear trees was not materially affected whether the fruit was harvested in one or three pickings. Pears, especially those of the Comice and

Bartlett varieties, when blushed with red kept longer than unblushed fruits. Core rot was found much more abundant in late than in early picked fruit.

Pressure tests with Grimes, Ortley, and Jonathan apples showed a gradual seasonal decrease, which was not, however, sufficient to serve as an indicator of maturity. Observations upon Grimes apples picked on six dates showed the late picked fruits not only to keep best but to be larger in size and to have a higher flavor. With Jonathan, on the other hand, early harvesting was most satisfactory. Removal of bloom from Rome Beauty apples resulted in increased weight losses, maintained uniformly throughout the season, and an earlier decline than in normal fruits.

[Strawberry tests at Hammond, La.], B. Szymoniak (*Louisiana Stas. Rpt. 1923, pp. 51–53*).—Of various combinations of fertilizing ingredients used on the Klondike strawberry, that comprising 120 lbs. of nitrate of soda, 240 lbs. of acid phosphate, and 75 lbs. of sulphate of potash gave the highest yield of fruit. In a test of 10 varieties, Nick Ohmer not only produced the largest yield but also the earliest ripening fruit.

[Grape pruning investigations at the Nebraska Station] (*Nebraska Sta. Rpt. [1923], pp. 20, 21*).—A comparison upon vigorous 7-year-old vines of the cane and spur systems of pruning indicated the superiority of the former. The cane pruned vines averaging 96.6 buds yielded in 1923 6,983.2 gm. of fruit per vine, 73.94 per cent of the buds were productive, the clusters averaged 62.24 gm., and the average number of clusters from each productive bud was 2.53. On the other hand, the spur pruned vines averaging 62.1 buds produced 5,974.2 gm. of fruit, bore 66.6 per cent of productive buds, their clusters averaged 60.99 gm., and the average number of clusters per productive bud was 2.26.

Spraying schedule for grapes, C. R. Phipps (*Missouri Fruit Sta. Circ. 22 (1924), pp. 4, fig. 1*).—In connection with a spraying schedule, there are presented brief notes on diseases, insects, spraying materials, and spraying equipment.

The Guatemalan avocado in Hawaii, W. T. Pope (*Hawaii Sta. Bul. 51 (1924), pp. 24, pls. 10*).—A general discussion in which is presented information concerning the introduction and early history of the Guatemalan avocado in Hawaii, botanical characters, methods of propagation, cultural requirements, control of insect pests, probable yields, and the composition and uses of the fruit, as well as technical descriptions of important varieties.

The Hawaiian tree fern as a commercial source of starch, J. C. Ripperton (*Hawaii Sta. Bul. 53 (1924), pp. 16, pls. 7, figs. 2*).—In order to determine the commercial possibilities of the Hawaiian tree fern, studies were made of its rate of growth and of the character of the starch manufactured therefrom.

Notwithstanding the fact that the fern can be successfully planted upon cut-over areas, it is believed that the rate of growth (4.35 in. vertically per year) is too slow to make commercial growing feasible. At the present time the cost per ton of bringing the raw product to the mill is greater than the cost of producing most of the common starch crops of Hawaii.

In chemical composition the core of the tree fern was found to resemble that of other starch crops, especially the edible canna. Morphologically, the starches of the different tree ferns were found very similar, differing chiefly in size, but also somewhat in shape. Tree fern starch is used for both culinary and laundry purposes, and for the latter use is considered superior to cornstarch. In Hawaii the starch of the tree fern is used chiefly in the preparation of poi.

The gladiolus: Its propagation, culture, and varieties, C. W. Ellenwood (*Ohio Sta. Mo. Bul., 9 (1924), No. 5–6, pp. 95–99*).—A brief popular discussion.

Hedges for Florida, H. Mowry (*Florida Sta. Bul. 172* (*1924*), *pp. 20, figs. 13*).—A general discussion, in which the author presents information on the planting, cultural care, and pruning of hedges, and upon various species utilized or capable of being utilized as hedge material.

FORESTRY.

Trees and how they grow, G. C. Nuttall (*London and New York: Cassell & Co., Ltd., 1923, new ed., pp. XI+184, pls. 70*).—A new edition (E. S. R., 30, p. 843) of a popularly written treatise on the life histories of important shade and forest trees of Great Britain and northern Europe.

Forest tree planting, A. H. Richardson (*Ontario Dept. Lands and Forests, Forestry Branch Bul. 1* (*1924*), *pp. 71, figs. 31*).—A general discussion.

Western forest trees, J. B. Berry (*Yonkers, N. Y.: World Book Co., 1924, pp. XII+212, figs. 97*).—A guide to the identification of trees and wood of a large number of western North America forest species.

A manual for northern woodsmen, A. Cary (*Cambridge: Harvard Univ. Press, 1924, 3. ed., pp. XIV+302, pls. 3, figs. 75*).—The principles and practices of land surveying, forest mapping, log and wood mensuration, and timber estimating are concisely presented in this pocket manual, the second edition of which was earlier noted (E. S. R., 38, p. 751).

Comparison of tape and caliper measurements, H. Krauch (*Jour. Forestry, 22* (*1924*), *No. 5, pp. 537–539*).—Diameter measurements taken with calipers and with tape upon trees in sample plats in the Coconino National Forest, Ariz., indicated that when a sufficient number of individual trees are included in a study there are only slight differences between the measurements obtained by either method. In general, tape measurements averaged slightly higher than caliper measurements, but the latter are considered more satisfactory in that they may be taken much more rapidly and also tend to avoid errors due to loose bark, knots, etc.

Some developments in Pennsylvania forest nursery practice, G. S. Perry (*Jour. Forestry, 22* (*1924*), *No. 5, pp. 546–552*).—Studies at the Pennsylvania State Forest School at Mont Alto indicate that the heavy loam soil characteristic of that locality can be greatly improved for forest nursery purposes by incorporating various materials. Charcoal screenings were valuable but difficult to obtain. Nursery beds to which decayed hardwood sawdust was added at the rate of 6 and 10 lbs. per 100 sq. ft. produced 124 and 105 white pine seedlings per square foot, respectively, as compared with 53 for the control bed and 133 for the charcoal bed. In respect to vigor the sawdust-treated seedlings grew better than the control and equaled those of the charcoal-treated beds. Anthracite coal ashes did not give so good results as sawdust.

Hemlock seed sown December 1 gave much better results than that sown May 1, indicating that hemlock seed either can not withstand the desiccation incident to storage or else requires the stimulus of cold combined with moisture found only in the open ground. Hemlock seed beds under half shade were superior to beds under three-quarters shade, but it is believed that the heavy watering given the beds may have affected these results.

Among the many species of seed tested at Mont Alto, shortleaf pine was the latest to germinate, it being evident that high soil temperatures are required to secure rapid and abundant germination of this species. Sycamore and mulberry seeds also required considerable heat and the light of the direct sun for strong germination. Shortleaf pine seedlings required transplanting when two years old on account of unusual taproot development and the peculiar weak structure of the root collar in older plants.

As indicated by average height measurements of 2-year-old seedlings of various species the loblolly pine is an extremely rapid grower. A tabulation of height growths and plant survival in seedling beds shows the conifers to be more tolerant to crowding than the oaks or larches.

Polyembryonism in sugar pine, A. W. JACOBS (*Jour. Forestry, 22 (1924), No. 5, pp. 573, 574, fig 1*).—In germination studies with sugar pine seed collected in the California Sierra Mountains, it was observed in several instances that individual seeds developed into two seedlings, each apparently sufficiently vigorous to continue growth.

Circumventing delayed germination in the nursery, W. C. WAHLENBERG (*Jour. Forestry, 22 (1924), No. 5, pp. 574, 575*).—Studies at the Savenac Nursery, Montana, gave evidence that fall sowing is much more satisfactory than spring sowing in the case of western white pine. In one instance, germination records showed 83 per cent for fall sown beds and less than 14 for spring sown beds. In another case the germination of fall sown beds was complete 15 days before that of the spring sown areas had even started. Furthermore, fall sown beds did not require artificial shading. The optimum time for sowing seed was found to be late August and early September.

The influence of the age of the parent Scotch pine tree upon the progeny [trans. title], BUSSE (*Ztschr. Forst u. Jagdw., 56 (1924), No. 5, pp. 257–286, fig. 1*).—Careful observations upon Scotch pine seedlings raised from seed taken from trees averaging 16, 47, 50, 74, 112, 140, and 170 years of age lead to the general conclusion that there is no permanent effect of parent age upon the development of the progeny. Seedlings from young mother trees made an exceptionally vigorous start, but at the end of 7 years the average height increment of all age classes was approximately equal. It is believed that the early vigor of seedlings from younger parents is due to the larger size and weight of the seeds and not to hereditary factors. There were no significant differences in germination; in fact, the highest, 90 per cent, was recorded for the seed of the 140-year-old parent trees.

Chestnut wood in the tanning industry, R. W. GRIFFITH (*Jour. Forestry, 22 (1924), No. 5, pp. 542–545*).—A brief article in which the author points out that the destruction of the chestnut by the blight organism, *Endothia parasitica*, means a very serious loss to the American leather industry, which for a long period has relied upon the wood of this forest species as a source of tannin.

British Guiana woods for paper-making (*Bul. Imp. Inst. [London], 22 (1924), No. 1, pp. 14–26*).—Of 13 specimens of timbers and palm stems examined in relation to their possible value for paper making, 10 showed considerable promise.

How the United States can meet its present and future pulp-wood requirements, E. H. CLAPP and C. W. BOYCE (*U. S. Dept. Agr. Bul. 1241 (1924), pp. 100, figs. 29*).—A presentation of data obtained in a study of the pulp wood situation in the United States, where, because of the enormous paper and pulp wood requirements, the supply problem is becoming increasingly difficult. Since the American forests now supply only 49 per cent of the pulp wood used in the manufacture of paper, it is estimated that 870,000 cords of spruce, hemlock, and balsam and 180,000 cords of aspen would be required annually to offset present pulp wood importations. It is suggested, therefore, that a measure of temporary relief may be had by utilizing species hitherto neglected, by reducing the pulping waste in chemical processes, and by utilizing the waste material lost in lumbering operations. It is believed, however, that the main reliance in ultimately meeting the pulp requirements of the United States must rest on the growing of timber, the prevention of fire losses, and the development of the Alaskan resources. It is recommended that the pulp and paper industry should assume the leadership in timber growing on its own land and at the same time encourage and cooperate in forest investigations and forest protection.

Appended are tables relating to pulp wood consumption, present sources, imports, prices, and stands in various important forest sections and States.

Disquisitions on flora and soil of Danish woodlands [trans. title], C. H. Bornebusch (*Forstl. Forsøgsv. Danmark, 8 (1923), No. 1, pp. 148, figs. 11*).—A discussion, with brief English summary, of plant associations characterizing the various forest soil types in Denmark.

Progress report on forest administration in the Northwest Frontier Province for the period from 1st July, 1920, to 31st March, 1921, E. A. Greswell (*Northwest Frontier Prov. Forest Admin. Rpt., 1920–21, pp. [9]+14+XXVIII*).—This is the usual progress report (E. S. R., 45, p. 646).

Forestry in China, A. de C. Sowerby (*China Jour. Sci. and Arts, 2 (1924), No. 4, pp. 299–303, pls. 7*).—A brief article in which the author points out that due to the extraordinary indifference of the people the whole of central and eastern China is absolutely devoid of forests, and, furthermore, that no effort is being made on the part of the Government or individuals to conserve the forests in the more remote areas. For example, the Tung Ling Forest, opened to the people at the fundation of the Republic, has been sacrificed to the greed of settlers, who have cut down and burned magnificent oak, walnut, and elm trees. In no part of China has there been any replanting subsequent to cutting.

DISEASES OF PLANTS.

[Report on investigations of the Idaho Station in] plant pathology (*Idaho Sta. Bul. 133 (1924), p. 13*).—In a brief summary report of work in plant pathology it is stated that potato disease investigations have shown that leaf roll may appear late in the season as a slight rolling of the younger leaves in otherwise vigorous plants, and that the progeny from such plants may develop advanced symptoms of the disease and yield practically nothing. It was also found that the russet dwarf type of mosaic may appear as very slight mottling late in the season, and that the progeny may develop a severe case of the disease.

Experiments with inoculated and uninoculated sulphur for the control of scab of potatoes showed in two cases that inoculated sulphur applied at the rate of 300 and 600 lbs. per acre gave fairly good control. Copper carbonate dust gave good control of stinking smut with spring wheat, but with winter wheat copper sulphate gave the best results.

[Report of the Indiana Station] department of botany (*Indiana Sta. Rpt. 1923, pp. 15–21, figs. 3*).—In the experiments on cereal rusts the range of susceptibility to resistance of about 300 varieties of wheat was determined, and studies were made of more than 1,200 F_2 generation hybrids that have shown a definite segregation and inheritance of resistance to rust. Strains of rye resistant to several diseases and of sweet and dent corn resistant to leaf rust are reported. Notes are also given on resistance to other rusts, and a number of strains of snapdragon, clover, and alfalfa resistant to rust have been developed.

In the corn disease investigations it was found that susceptibility of various strains of corn to root rot, smut, Diplodia, and rusts is inherited.

Some greenhouse experiments are reported upon in which the nutrient requirements of various inbred strains and crosses were studied. It was found that the absorption capacities of inbred strains of Yellow Dent corn vary quite widely, the absorption capacity of phosphorus ranging from 0.39 to 1 per cent dry matter; aluminum from 0.21 to 0.67; iron from 0.026 to 0.063; and potassium from 0.47 to 5.59 per cent. It is claimed that susceptibility to *Gibberella saubinetii* was increased in the case of several crosses of corn grown under conditions where phosphates and potash were deficient. Similar results were not obtained with deficiencies of nitrogen and calcium. Chemical studies of the ash of plants confirmed the above conclusions.

The possibility of detecting the presence of leaf roll and potato mosaic by growing a single eye from tubers in the greenhouse during the winter is pointed out. Attention is called to the discovery that little or no reduction in yield occurred in cases in which the hills from healthy seed had acquired leaf roll during the current season. Consequently it is believed that seed selection from high-yielding hills will not tend to eliminate this disease.

In a study of tomato mosaic an attempt was made to control the disease by the destruction of ground cherries (*Physalis subglabrata*) in and around the beds in two fields, while the third received only ordinary cultivation. At the end of the season there was less than 2 per cent of mosaic in the fields where the weeds were suppressed, as compared with 14 per cent of mosaic in the field receiving ordinary cultivation.

Brief notes are given on a number of other plant diseases. A radish black rot is said to have been destructive, some varieties being more subject to attack than others. Soy bean mosaic was observed on 18 varieties of soy beans, and the work at the station has shown that mosaic does not reduce the germinability of the seed but does seriously reduce the yield of the crop. Soy bean bacterial blight was found to be introduced with the seed. Apple blotch canker is claimed to be introduced into new orchards with diseased nursery stock and into nurseries on diseased seedlings. The variety test of wheat for resistance to rosette has been continued, and it is said to be now possible to furnish a list of standard varieties which are apparently immune from this disease. Take-all of wheat, first found in Knox County in 1921, has not been reported in any other locality and does not appear to be a serious menace.

[Report of the Louisiana Stations] department of plant pathology, C. W. EDGERTON and C. C. MORELAND (*Louisiana Stas. Rpt. 1923, pp. 28–30*).—The investigations reported upon consist mostly of those on sugar cane diseases, corn root rots, and tomato wilt. The sugar cane work was largely confined to a study of mosaic diseases, and the authors consider the use of resistant or tolerant varieties the most promising method of control. A number of such varieties have been under observation, some of which appear to be very promising.

The corn root rot work consisted of obtaining data on a large number of ears of corn, the grain afterwards being tested for germination in the laboratory and field, the stand obtained, and the yield. No correlation was found between fungus infection and low yields, nor have germination tests given satisfactory indication of the yield.

The tomato wilt investigations have been confined largely to the growing of resistant varieties, testing those varieties grown in other localities, and the effect of commercial copper compounds in the soil on the development of wilt disease. It was found that resistant varieties gave good results, and that copper compounds applied to the soil had no effect in controlling wilt.

Among the miscellaneous investigations briefly reported, the authors state that the blackfire or angular leaf spot of tobacco was observed in the St. James tobacco district in 1923. A blight of longleaf pine seedlings occurred in several localities where reforestation was in progress.

Report of the division of plant pathology, F. A. Wolf (*North Carolina Sta. Rpt. 1923, pp. 91–93*).—A report is given of investigational work carried on by the staff during the year, a number of the investigations having been previously noted (E. S. R., 48, p. 350; 50, pp. 348, 840).

Detailed investigations of the strawberry leaf scorch, the occurrence of which was previously noted (E. S. R., 49, p. 747), have shown that the causal organism exists in two stages, the conidial stage of the Marsonia type, while the mature stage belongs to the genus Diplocarpon. The author assigns to the fungus the name *D. carliana* n. sp. Field trials are said to have given satisfactory control when destruction of the tops during June was followed by spraying at definite intervals during the following spring.

Take-all disease of wheat is reported in four counties in the State, and experiments on the influence of crop rotation and varietal resistance to this disease are in progress.

The occurrence of other plant diseases of some possible importance is noted. Among them is an anthracnose of dewberries, a pepper rot, a wilt of mung bean caused by a species of Fusarium, and a leaf spot of the same host plant.

[Report of the North Dakota Station department of] biology, H. L. Bolley (*North Dakota Sta. Bul. 174 (1924), pp. 29, 30, 31–35*).—Summary reports are given of various investigations conducted during the year, particular attention having been given to studies on flax wilt, some wheat diseases, and tuber diseases of potatoes.

Quoting from a report by W. E. Brentzel, heat canker of flax is said to be troublesome in the dry areas of the Northwest, the trouble being attributed to the succulent condition of the young plants and the high temperatures of the surface soil in contact with the plants. A Rhizoctonia and a Septoria-like disease of flax are mentioned as new in North Dakota.

Flax breeding for wilt resistance is being continued, and some promising new strains have been secured showing a high degree of resistance combined with good agronomic characters. Experiments with fertilizers have not shown that they controlled root or seed diseases of flax to any extent.

Studies are in progress on the causes of immunity of flax to wilt, which include investigations on the possible relation of the protein and glucosid contents of the plants.

Seed disinfection with formaldehyde, creosote, or corrosive sublimate did not reduce wheat scab and black point diseases, but in some cases the treatments severely injured the seed. Black point infection is said to be internal to the seed, and the disease is transmitted through the seed from year to year.

In connection with selections of Kubanka seed wheat two forms were found, one with and another without a brush on the distal end of the grain. Both forms have bred true, and no difference in their resistance to rust has been observed.

A comparative test was made of six varieties of wheat resistant to scab and various seedling diseases. D–1 (Monad) produced the highest yield and heaviest grain, while Kubanka wheat gave the lowest yield and the lowest weight per bushel.

In the study of potato diseases, the experiments thus far are said to offer little hope of producing resistant varieties through the growing of seedlings. Studies of tuber infections showed 63 per cent of the tubers infected by disease, blackleg, Fusarium wilt, and dry-rot organisms prevailing in the order named. Dry-rot was found to be due to *F. discolor sulphureum*. Cutting off the ends of tubers to determine their infection is recommended for the control of blackleg and dry-rot.

Considerable attention was given to seed and seedling diseases of wheat. *Gibberella saubinetii* was found on blighted wheat, and the seasonal cycles of the organism were studied. The perfect stage of the fungus was found on corn stubble in the spring. Careful grading of seed wheat and its treatment with hot water or chlorophol controlled the scab fungus.

Studies on the Helminthosporium blight of wheat were continued, and isolations from the black pointed grains yielded an organism that closely resembles *H. sativum*, although occasionally another type was isolated. The embryo of the seed was found to carry the mycelium of the fungus, which develops with the germination of the seed.

In experiments for the control of ergot of grain a salt solution combined with formaldehyde was found to injure the seed, but if the salt solution was used to remove infected seed and the sound seed were thoroughly washed to remove the salt it could then be treated with formaldehyde. In many instances increased percentages of germination were obtained.

Wheat rust investigations and barberry eradication in cooperation with the U. S. Department of Agriculture are being continued. A resurvey showed the occurrence of many barberry sprouts to which salt was applied to complete their eradication.

Report of the plant pathologist, C. M. Tucker (*Porto Rico Sta. Rpt. 1923, pp. 15, 16*).—Experiments for the control of the brown spot disease of rice, due to Helminthosporium, are in progress, hot water and chemical seed treatments as well as soil infection, insects as disseminating agents, and varietal resistance being studied.

The author reports a root disease of vanilla, due to *Fusarium* sp., which has destroyed the original vanilla planting at the station. The organism appears to exist in the soil, and experiments for its control by the use of various fungicides have been undertaken.

Experiments on the production of strains of bananas resistant to banana wilt (*F. cubense*), although in progress for seven years, have so far not given encouraging results. In Porto Rico this disease is most serious on the variety Chamaluco, but what seems to be an identical Fusarium has been obtained from a diseased pseudostem of a variety of plantain.

A progress report is given of an experiment undertaken to produce a scab-resistant variety of grapefruit, in which a cross was made between Duncan, a susceptible variety, and Triumph, a resistant one. These seedlings were examined when three years old, and 48 trees were found to be heavily infected with the fungus, 89 slightly infected, and 187 free from any indication of infection.

Annual report of the division of plant pathology and botany for the fiscal year 1922–1923, R. A. Toro (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1923, pp. 59, 60; also in Spanish ed., pp. 58, 59*).—The principal investigations during the year were conducted on varietal resistance to gumming disease of sugar cane, the control of yellow stripe disease by roguing, the distribution and transmission of dry top rot of sugar cane, and onion mold due to *Macrosporium parasiticum*. Other diseases noted are canker of pigeon peas, tomato wilt due to *Bacillus solanacearum*, tobacco mosaic, and Helminthosporium spot of sugar cane.

Control equipment for the study of the relation of environment to disease, G. L. Peltier and R. W. Goss (*Nebraska Sta. Research Bul. 28 (1924), pp. 3–16, pls. 3, figs. 4*).—A description is given of apparatus designed and constructed by the authors for the study of plant disease problems in which the relation of various environmental factors is to be considered.

Greenhouse controls, the control of soil and atmospheric factors, and incubation chambers are included.

Investigations on the nematode disease of cereals caused by Tylenchus tritici, R. W. Leukel (*Jour. Agr. Research* [*U. S.*], *27* (*1924*), *No. 12, pp. 925–956, pls. 5, figs. 2*).—The author presents the results of recent studies of the nematode disease of cereals due to *T. tritici*, together with detailed descriptions of the common symptoms of the disease.

This nematode disease appears to be confined in the United States to Virginia, West Virginia, North Carolina, South Carolina, and Georgia, some fields being damaged as much as 50 per cent. The disease attacks wheat, rye, emmer, and spelt almost equally, while oats and barley are practically immune, as are also various grasses. In the seedling stage the disease causes wrinkling, twisting, or various other distortions of the leaves. Infected plants are usually shorter and thicker than normal ones, and badly infested seedlings often wilt and die. In the mature heads the disease is characterized by the presence of hard dark galls in place of normal grain.

The disease is said to be most commonly spread by means of infested seed and straw, although screenings and other agencies may carry the disease to a new area. It was found that the organisms were unable to effect a general invasion of the wheat at a distance of more than 4 in. laterally, while they moved vertically from 12 in. below the seed and produced infection. The plants were found to be invaded after the loosening of the coleoptile, and it is believed that the invasion may continue until elongation of the culm occurs. It is said that the organisms may winter over within the protective galls or in a free-living state in the soil or between the leaf sheaths of the host plants.

It is claimed that the disease may be readily controlled by the use of clean seed sown on clean soil. Susceptible cereals should be kept off infested fields for at least one year, as it is probable that this would starve the nematodes in the soil.

Ergot and its control, W. Weniger (*North Dakota Sta. Bul. 176* (*1924*), *pp. 23, figs. 12*).—The results are given of a study of ergot, which is said to be an important disease of rye, wheat, barley, and many wild grasses growing in North Dakota. It is said to be quite common in rye, as well as in durum wheat and in many of the wild grasses which constitute a large acreage of prairie hay. The severity and spread of the disease are dependent on favorable weather conditions, and its control can be effected by practicing crop rotation or treating seed grain. For this purpose the author recommends the floating of ergotized grain from sound grain by means of a salt solution, after which the grain is thoroughly washed and treated with formaldehyde.

Brittle straw and other abnormalities in rye, F. R. Davison, H. E. Brewbaker, and N. A. Thompson (*Jour. Agr. Research* [*U. S.*], *28* (*1924*), *No. 2, pp. 169–172, figs. 2*).—The results are given of a study of some abnormal types that have appeared in inbred strains of rye at the Minnesota Experiment Station, particular attention being given to a condition called brittle straw. It is said that the normal type of rye is usually dominant when in the heterozygous condition, and that such abnormalities are rarely seen in commercial varieties. Inbreeding, either by selection or by self-fertilization, brings about a recombination of the recessive abnormality factors and results in the appearance of abnormal plants in the inbred strains.

Brittleness of straw, chlorophyll deficiency, male sterility, and crinkled awns have appeared as abnormalities in inbred strains of Minnesota No. 2 rye. Chemical analyses show a low percentage of crude fiber and a high percentage of pentosan in brittle straw as compared with the same constituents in healthy plants. Brittle plants have a high moisture content correlated with a high pentosan content. The differences in starch, pectin, ash, and sugar were not great in amount. It is believed that carbohydrates in the brittle plants are not normally transformed into cellulose and wall-forming substances generally designated as crude fiber but accumulate as pentosans. The greater thickness of cell wall in the normal rye plant accounts in part for its greater strength as compared with brittle rye straw. The amount of lignin in normal rye straw was found to exceed greatly that in brittle rye.

Effects of the modified hot-water treatment on germination, growth, and yield of wheat, V. F. TAPKE (*Jour. Agr. Research* [*U. S.*], *28* (*1924*), *No. 1, pp. 79–98, pls. 5*).—On account of the establishment of central or community plants for treating seed wheat by the modified hot-water method, the author investigated the effect of treatment on the germination, growth, and yield of treated seed wheat.

The effects of the modified hot-water treatment on wheat were found to be largely dependent on the conditions of the seed coats and the soil. The latter varied greatly, and the physical condition of the seed coats was found to be dependent on the combination of such variable factors as the kind of weather during the period from ripening to threshing of grain, adjustment and speed of the cylinder in the threshing machine, size of the wheat kernel, and handling of the grain after threshing. The effects of the treatment on the germination of the machine-threshed seed were severe. Soil germination tests of 58 different lots of seed representing 32 distinct varieties were 33.3 per cent lower for the treated than for the untreated wheat. In none of the lots did the germination of the treated seed equal that of the untreated. When the seed coats were intact, the modified treatment measurably retarded germination, although it reduced it very little, if at all. Some evidence was obtained which seemed to indicate that the action of the treatment on spaced plants may extend beyond the germination period into the later stages of plant growth.

As to the effects of treatment on yield, under the conditions of the experiments plants from treated seed did not outyield plants from untreated seed except when sown at a rate compensating for treatment injury.

So far as the tabular statements presented show, loose smut was practically eliminated by the treatment.

Wheat rust nursery, L. JORGENSON (*North Dakota Sta. Bul. 174* (*1924*), *pp. 85, 86*).—A report is given of a percentage of rust infection observed in 1921 and 1922 on some 25 varieties of wheat and 6 varieties of oats.

Dusting and spraying cantaloupes, R. A. JEHLE and S. F. POTTS (*Maryland Sta. Bul. 263* (*1924*), *pp. 169–180, figs. 6*).—The results are given of two seasons' work on the control of leaf blight, mildew, and anthracnose of cantaloups, Bordeaux mixture, several commercial compounds, and a mixture of dry dehydrated copper sulphate and lime being compared. It is claimed that the yield of cantaloups may be increased from 10 to 15 per cent by spraying and dusting and the quality of the fruit improved. The ripening period was also prolonged 2 or 3 weeks by the treatment. As a result of the authors' investigations the best control was obtained by making 5 applications at from 7- to 10-day intervals, beginning just before the vines begin to run. About 100 lbs. of dust or 375 gal. of liquid Bordeaux mixture were required to treat 1 acre of cantaloups in 5 applications. Very little difference in the cost or results was noticed between the use of dusts and liquid fungicides.

A Fusarium disease of celery, R. C. THOMAS (*Ohio Sta. Mo. Bul.*, *9* (*1924*), *No. 5–6, pp. 88–90, figs. 2*).—A popular description is given of a crown rot of celery, which is caused by a species of Fusarium. The symptoms produced are said to resemble closely the Rhizoctonia root rot. The latter, however, is more generally found in heavy soils, while the Fusarium disease has been observed to be serious and persistent on light and drained soils. The green types of celery are said to be only slightly subject to the disease.

Corn rootrot studies, T. F. MANNS and C. E. PHILLIPS (*Jour. Agr. Research [U. S.], 27 (1924), No. 12, pp. 957–964, pls. 4*).—The authors state that most investigators agree on the symptoms manifested by corn root rot disease but differ in opinion as to the relative importance of the organisms causing it. In a previous publication (E. S. R., 46, p. 239) the authors reported four parasitic fungi very common in seed corn. These were *Cephalosporium sacchari*, *Gibberella saubinetii*, *Fusarium moniliforme*, and *Diplodia zeae*. Studies were made to determine the relative importance of the different fungi, and it was found that *G. saubinetii* was the most active seedling parasite of corn and may be an important factor in reducing stands. In the investigations *F. moniliforme* appeared less active as a seedling parasite than *G. saubinetii*. *D. zeae* was quite active in retarding the growth of the young plants, and plants inoculated with this organism were much inferior to the controls.

The organism previously reported as abundant in corn and referred to as *C. sacchari* showed no pathogenicity in this study. Cultures of the organism obtained from India under the name *C. sacchari* proved in the authors' experiments to be a Fusarium that was somewhat active as a seedling parasite of corn, when used in infection experiments.

Stewart's disease or bacterial wilt of sugar corn, R. C. THOMAS (*Ohio Sta. Mo. Bul., 9 (1924), No. 5–6, pp. 81–84*).—A popular description is given of bacterial wilt of sweet corn, and suggestions are offered for its control. The control measures recommended are the planting of disease-free seed and the adoption of resistant varieties. Preliminary experiments afford some indication that infected seed may be rendered safe for planting by heating for one hour at a temperature of from 150 to 158° F. The author claims that practically all of the extremely early varieties are susceptible to the disease, while later ones represented by the Evergreen group are all resistant. A cross between the Golden Bantam, which is susceptible, and Stowell Evergreen has proved to be resistant. There is believed to be a tendency for the resistant quality to be lost or reduced when selections are made for earlier maturing strains.

Potato diseases (*Ohio Sta. Bul. 374 (1924), pp. 30, figs. 18*).—Popular descriptions are given of potato diseases, with suggestions for their control, this bulletin being designed to supersede Bulletin 319 (E. S. R., 39, p. 53).

Diseases of the potato which may be detected in the seed tubers, P. E. TILFORD (*Ohio Sta. Mo. Bul., 9 (1924), No. 5–6, pp. 85–87, figs. 2*).—Descriptions are given of some of the diseases that produce internal discoloration of potato tubers, among them, Fusarium wilt, blackleg, net-necrosis, blackheart, and hollow heart.

Sugar-cane diseases, R. MENÉNDEZ RAMOS (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1923, pp. 21, 22; also in Spanish ed., pp. 21, 22*).—The gumming disease of sugar cane is said to have occurred in a number of new localities, large plantings of the variety Otaheite being practically destroyed. A disease known as dry top rot of sugar cane, caused by *Plasmodiophora vascularum*, has been found in a number of localities in the island. The planting of uninfected cuttings and the abandoning of diseased plantings after the first crop is harvested are recommended for its control. It is believed that the rotation of cane with some leguminous crops would probably starve out the organism.

Notes are given on the mosaic disease of sugar cane, and the roguing method is considered the only means of control in fields with less than 15 per cent infection.

Raspberry mosaic and blue stem, W. H. RANKIN (*New York State Sta. Circ. 75 (1924), pp. 4*).—The conclusion is reached of two years' experiments on the control of raspberry mosaic and blue stem. For the mosaic the author recommends roguing the plants in June and in August, the diseased bushes and all roots to be removed carefully and promptly. All bushes standing in the row next to the diseased ones should be dug and carried away, and suckers which appear from pieces of roots that are left in the rogued areas should also be removed.

The blue stem or wilt is said to be an important disease of black raspberries, and is caused by a fungus which is believed to be probably identical with *Verticillium albo-atrum*. This fungus is known to attack a number of species of plants, and it has also been proved that it lives over in the soil. It is considered likely that blue stem will occur if black raspberries are planted after potatoes, eggplants, tomatoes, salsify, okra, cotton, etc.

It is believed that control of blue stem or wilt will consist in the use of resistant strains or varieties.

Manganese chlorosis of pineapples: Its cause and control, M. O. JOHNSON (*Hawaii Sta. Bul. 52 (1924), pp. 38, pls. 4, figs. 5*).—A review is given of the literature and investigations that led to the discovery of the use of a solution of iron sulphate for the control of pineapple chlorosis due to manganese in the soil (E. S. R., 36, p. 850).

Attention is called to the difference between lime-induced chlorosis and that caused by manganese, the latter usually occurring under acid conditions.

Experiments with rice are reported upon, which indicate that chlorosis is due to the depression of the assimilation of iron by the plant and that manganese dioxid, which is present in the soil or formed from manganese salts, oxidizes the iron in the soil into a ferric form which is assimilated with difficulty by the plant.

The author claims that no method of preparation of the highly manganiferous soils so far tested allows the plant to absorb sufficient iron for its use, and he recommends spraying the plants with a solution of iron sulphate whenever they show any yellowing. Ordinarily about four sprayings a year are sufficient. It is said that more than half the pineapple fields of Hawaii are now regularly sprayed.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Twenty-third report of the State entomologist of Connecticut, 1923, W. E. BRITTON (*Connecticut State Sta. Bul. 256 (1924), pp. 221-316, pls. 16, figs. 8*).—Following an introductory account, the author briefly mentions the more important entomological features of 1923 and then deals with the nursery and imported nursery stock and apiary inspection work of the year, the details being presented in tabular form. A Report on Gipsy Moth Work, Year Ending June 30, 1923, by J. T. Ashworth and W. E. Britton (pp. 253-267), gives the details of the control and eradication work, including a brief account of the parasites liberated.

Experiments in Dusting Versus Spraying in Connecticut Apple Orchards in 1923 are reported upon by M. P. Zappe and E. M. Stoddard (pp. 267-274). The liquid spray has given somewhat better results in the control of injurious insects and fungi on apple trees than any of the dust mixtures, but the difference has not been so great in the control of insects as in the control of fungus diseases. The sulphur arsenate dust gave fair control of insect pests and of fungus diseases, particularly apple scab, while the copper arsenic dust in most cases gave nearly as good control of insect pests as the sulphur arsenate dust, but was much less effective in the control of fungus diseases. It is pointed out that the year 1923 was characterized by little rainfall and a consequent reduction in the prevalence of fungus diseases. It is thought that the dust mixtures were far more satisfactory under these conditions than they would have been in a wet season, and that in the presence of a greater amount of moisture the copper arsenic dust would have been changed to a Bordeaux mixture and would compare more favorably with the sulphur arsenate dust.

Tests of Sodium Hypochlorite for Control of American Foul Brood of Bees are discussed by P. Garman (pp. 275, 276). This chemical, sold under the trade name Be-Helth, had been recommended highly for this purpose and was tested, but no definite conclusions could be drawn from the results obtained.

In Further Experience with Paradichlorobenzene as a Remedy for Peach Borers, M. P. Zappe reports (pp. 276, 277) that applications made in the falls of 1921 and 1922 to trees which had been set 11 years killed all borers below the surface of the soil, the only borers remaining alive being those above the surface of the soil, where the fumes could not affect them.

Under the heading of The European Corn Borer in Connecticut (pp. 277–284), the status of the pest is considered and a list given of infested areas in eight States. This pest was first found in Connecticut in the fall of 1923 in three small separate infestations along the shore region, two in Groton, and one in East Lyme. These infestations are believed to have originated from moths emerging from broomcorn from Europe, reshipped by boat from New York to Boston for fumigation.

The Prevalence of Oriental Peach Moth (pp. 284–287) and the history of the occurrence of this pest in the State are briefly reviewed, together with a brief summary of its life history and of control measures. An infestation of The Larch Leaf-miner or Case Bearer (*Coleophora laricella* Hubn.) (pp. 288–291), a European pest which has caused damage to larch trees of European forests, particularly in Germany, was found in the town of Canaan. The pest has been previously recorded from Canada and northeastern United States. Brief notes on its life history and habits and technical descriptions of its several stages are given, and natural enemies and control measures briefly dealt with. The Asiatic Beetle (*Anomala orientalis* Waterh.) (pp. 291–293), previously recorded by Britton as occurring at New Haven (E. S. R., 50, p. 50), was discovered in 1923 in the same locality causing serious injury to lawns. It is pointed out that, since the pest was imported in balls of earth from Japan before the prohibition of such shipments by the U. S. D. A. Federal Horticultural Board, there is a strong probability that it has been introduced in other localities. The author records (pp. 293, 294) two separate Swarms of Aphids during the year, one in June and the other in September, the first having been *Euceraphis deducta* Baker and the September swarm *Calaphis betulaecolens* Fitch. Mosquitoes and Human Welfare is next considered (pp. 294–303). Mosquito Control Work, Season of 1923, is reported by R. C. Botsford (pp. 303–310).

The report concludes with Miscellaneous Insect Notes (pp. 310–314), which deal with swarms of butterflies, the giant waterbug, house cricket, birch leaf skeletonizer (*Bucculatrix canadensisella* Chamb.), spruce leaf-miner (*Recurvaria piceaella* Kearf.), European pine shoot moth (*Evetria buoliana* Schiff.), in Connecticut, box leaf-miner (*Monarthropalpus buxi* Labou), the apple and thorn skeletonizer, swarms of the chain spotted geometer, the flight of cotton moths (*Alabama argillacea* Hubn.), and a Japanese weevil [*Pseudocneorrhinus setosus* Roel.], in Connecticut.

[Entomological studies at the Idaho Station] (*Idaho Sta. Bul. 133 (1924), pp. 11, 12*).—A brief report is made of work with the alfalfa weevil conducted in the lower Snake River basin, where spraying seems to be the only reliable means of control, the liquid spray being found superior to the application of dust. The work with the fruit-tree leaf-roller at five points in the State during 1923 is said to show the superiority of oil over lead arsenate in its control and to emphasize the need of great care and thoroughness in the application of oil sprays.

[Report of the Indiana Station] department of entomology (*Indiana Sta. Rpt. 1923, pp. 26–30, figs. 2*).—This is a report upon the occurrence of, and work of the year with, the more important insects. The San José scale continued to be the most serious menace to the fruit industry of the State, and miscible oils proved more effective than lime sulphur as dormant sprays, as has also the new lubricating oil emulsion. Investigations of the use of oil emulsion in summer control and its combination with fungicides are under way. The paradichlorobenzene treatment for the peach borer has proved sufficiently effective in the hands of the Indiana peach grower to become a regular practice. The flower thrips was reported in 1922 for the first time as a peach fruit pest of first-class importance, having been very abundant and destructive in many sections of southern Indiana. The apple fruit chafer *Metachroma interruptum* Say was very injurious in an orchard near Decker, Knox County, a large percentage of the fruit in one section of the orchard having been damaged sufficiently to make it unmarketable. Brief reference is made to melon insects, the chinch bug and Hessian fly, the oyster shell scale and cottony maple scale, and to the insect pest survey.

[Report of the Louisiana State Station] department of entomology, T. H. JONES and W. G. BRADLEY (*Louisiana Stas. Rpt. 1923, pp. 21–25*).—Reporting upon insects injurious to corn, reference is made to the southern corn rootworm (spotted cucumber-beetle) and to the corn earworm. The rootworm was found injuring the stalks of the first four plantings only, the injury being most severe to plantings made from March 10 to April 7. In field experiments with paradichlorobenzene for the control of this pest, the kernels failed to germinate when 1 gm. or more of the material was placed with the seed, but the material interfered with germination to a lesser extent when placed at distances of 3 and 6 in. from the seed. When the paradichlorobenzene was applied at like distances from young cornstalks, less damage was apparent than when it was placed with the seed. Rootworms were found injuring corn in hills when the substance had been placed 12 in. distant. Observations indicate that the larvae that injure young corn come from eggs that are deposited before the corn is planted, and that corn planted in land that has previously had a growth of grass on it is more apt to be injured.

The results of examinations made to determine the percentage of corn ears injured by the corn earworm in a succession of plantings made in the same field at Baton Rouge, and of similar examinations for the sugar cane borer, are reported on in tabular form. Investigations of wild grasses as posssible food plants of the sugar cane borer resulted in the finding of larvae feeding in the stems of *Panicum barbinode*, *P. gymnocarpon*, *P. dichotomivorum*, *Paspalum larranagae*, *Holcus halepensis*, *Andropogon glomeratus*, and volunteer rice. The observations indicate that wild grasses are important in relation to injury to corn in sections where these grasses are abundant, the sugar cane borer flying from the grasses to the corn in the spring.

Brief reference is made to observations of the immature stages and adults of tabanids under field conditions and the rearing through the adult stage of larvae collected in the field. Forty-six species (35 Tabanus, 10 Chrysops, and 1 Diachlorus) have been collected, and adults of 19 species have been reared from larvae taken in the field, a paper relating to which has been noted (E. S. R., 49, p. 657). In studies of repellent mixtures, one made from pine tar was found more efficient than those made from the pine and crude oils, but it did not keep the flies off completely.

Entomological work [at the Louisiana Sugar Station], T. E. Holloway (*Louisiana Stas. Rpt. 1923, p. 9*).—A brief statement is made of work conducted, in cooperation with the U. S. D. A. Bureau of Entomology. The tachinid parasite introduced from Cuba, as previously noted (E. S. R., 49, p. 848), is still active and spreading over the sugar parishes, having been found on 16 plantations, but it has not, as yet, caused any reduction in the damage of the cane borer. A parasite received from Europe was reared with the sugar cane borer as host, for the second year, and liberated on two plantations.

In experimental dipping of cane for the control of the sugar cane mealybug, it was found that temperatures below 50° C. (122° F.) were ineffective. Seed cane soaked in water heated to 50° for 20 minutes is recommended for the control of the pest, since cane is not harmed unless the eyes are soft and ready to sprout.

In examinations of sugar cane for insect injury made along the west coast of Mexico and Lower California, a new tachinid parasite was discovered and also a moth borer not previously reported from Mexico.

Report of [the North Carolina Station] division of entomology, F. Sherman et al. (*North Carolina Sta. Rpt. 1923, pp. 73–80*).—Brief reports are made upon 18 projects that have been under investigation. It has been found that at the rate of 1 lb. to 4 gal. of water laundry soap makes an effective spray against the cabbage aphid, rose aphid, and other species without the addition of oil, tobacco, or other ingredients.

Investigations of the boll weevil by R. W. Leiby and J. A. Harris, conducted in Moore and Hoke Counties, show the weevil to emerge from hibernation during the latter half of May and emergence to continue until about June 25. Oviposition was found to begin June 19, the eggs hatching in 3 days. About 10 days are required for the development of the larva and 4 days for the completion of the pupal stage, with 2 additional days for emergence. The life of the summer-reared weevils was found to average about 50 days. An extension circular reporting upon control work with poison dust has been noted (E. S. R., 50, p. 57). It is said that by November, 1923, the boll weevil had reached all of the cotton-growing area of the State.

Local outbreaks of the fall cankerworm in forests in some 8 or 10 mountain counties occurred from 1917 to 1920, artificial control work being found impracticable. Work with natural enemies was taken up (E. S. R., 47, p. 55), and two small lots of *Calosoma sycophanta* were liberated.

Investigations of the Mexican bean beetle were conducted at Bryson City, Swain County, by J. C. Crawford. The beetles began to appear in gardens the last week in May, the majority coming out during the first week in June. Eggs deposited by the overwintering beetles hatched in about 7 days, 22 days being required for the development of the larva and 7 days for the pupal stage. The second and third generations required less time, reaching the crest of abundance from August 5 to 10 and September 5 to 10, respectively. There was practically no fourth generation at Bryson City, although it is expected that a fourth would occur under normal weather conditions. There was found to be little difference in the effectiveness of calcium aresenate and arsenate of lead against the pest, but the arsenate of lead at times caused severe burning of the plants and its use is not recommended.

A brief report of the entomologist, Z. P. Metcalf (pp. 79, 80), follows. Observations of the cornroot worm indicate that proper rotation may control the pest in the eastern part of the State.

Entomology [at the North Dakota Station], R. L. Webster (*North Dakota Sta. Bul. 174 (1924), pp. 45–49, figs. 2*).—Brief reference is first made to studies of the pale western cutworm, a more extended account of which is noted on p. 856. This is followed by a brief account of beekeeping in North Dakota. The experimental apiary was increased to 15 colonies. The great increase in acreage of sweet clover in the State has made beekeeping very profitable to those engaged in the industry.

Report of the entomologist, W. V. Tower (*Porto Rico Sta. Rpt. 1923, pp. 11–14, 15*).—Reference is made to the fumigation of warehouses with hydrocyanic acid gas for the control of the cigarette beetle. In demonstration work, pipes were installed in two warehouses and liquid hydrocyanic acid was used with success. All stages of the beetle infesting cigars were destroyed. It is pointed out that, owing to the relatively humid air of Porto Rico, fresh cigars should be aired for three or four weeks, and others longer, after being fumigated.

Hundreds of acres of cotton in the Cabo Rojo district are said to have been destroyed by cutworms and the cotton worm, and good results were obtained from poisoned bait. The cucumber beetles *Diabrotica innuba* and *D. bivittata*, which attacked casaba melons, cucumbers, and watermelons during the winter months, were controlled by Bordeaux mixture 2–3–50 and arsenate of lead 1.5 lbs.

The giant toad (*Bufo agua*), which was introduced into Porto Rico several years ago, is said to be rapidly increasing in numbers.

Annual report of the division of entomology [Porto Rico] for the fiscal year 1922–23, G. N. Wolcott (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1923, pp. 51–57; also in Spanish ed., pp. 51–57*).—In white grub experiments in which *Lachnosterna* (*Phyllophaga*) *portoricensis* Smyth was used, it was found that paradichlorobenzene will kill the grubs if applied at the rate of from 700 to 800 lbs. per acre, but the cost of the raw chemical makes its use unprofitable in the cane field. It is useful for killing or repelling cockroaches, termites, especially the "polilla," *Cryptotermes brevis* Wlk., insects affecting stored grain and seeds, and some other classes of insects.

The elaterid beetle *Pyrophorus luminosus* Ill., the larvae of which destroy white grubs, has been briefly considered in a circular by the author, previously noted (E. S. R., 50, p. 457). Aphids (*Aphis maidis* Fitch) were found by F. Sein, jr., to transmit mosaic disease from diseased grass to sound sugar cane. Poisoning experiments conducted with the coffee shade tree ant (*Myrmelachista ambigua ramulorum* Whlr.) will be continued.

An experiment conducted by Sein at Lares showed that bees are not essential to the pollination of coffee, as about 70 per cent of the blossoms set berries on the trees from which bees were excluded, on caged trees to which the bees had access, and on adjacent uncaged trees. Destruction of infested bulbs and morning picking of the beetles which hide under slices of banana bulbs are thus far the only means of combating the banana root-borer. A survey shows that the tobacco leaf-miner (potato-tuber worm) does not occur in all the shade tobacco districts of the mountains, not even in sun tobacco, nor at any point with an abundance of rainfall, but it is a serious pest in the drier sections of the island, especially around Yauco and Sabana Grande. *Aeolus elegans* Fab. was found to be the source of injury to recently transplanted tobacco at Cayey. Reference is made to the account of the spread of the pink bollworm, previously noted (E. S. R., 50, p. 357). An outbreak of the cotton worm which occurred at Hatillo early in the summer was checked at once by parasites, particularly *Chalcis incerta*. The cotton stainers *Dysdercus andreae L.* and *D. neglectus* Uhler caused considerable damage to late planted cotton in the Boqueron district. The chrysomelid *Metachroma antennalis* Weise was reported in June as injuring cotton. Mulberry trees used at the station for feeding silkworms became infested with *Asterolecanium pustulans* Ckll., which spread from *Grevillea robusta*.

Insect control [in the Virgin Islands], W. M. Perry (*Virgin Islands Sta. Rpt. 1923, p. 13*).—The southern cabbage butterfly (*Pontia monuste*), and the diamond-back moth are reported to have severely attacked mustard, turnips, cabbage, kohl-rabi, and radishes, the former being effectively controlled by arsenical sprays on turnips, radishes, and mustard. The West Indian sugarcane root-borer (*Diaprepes abbreviatus*) is said to have seriously damaged all varieties of beans and okra. Picking by hand was found to be the most satisfactory means of control. The Hawaiian beet webworm (*Zinckenia fascialis*) continually attacked beets, carrots, and Swiss chard, but was controlled by powdered arsenate of lead and air-slaked lime in equal parts. Papaya trees at the station became heavily infested with the West Indian peach scale, but were cleansed by the use of 1 lb. of fish oil soap to 5 gal. of water.

The control of climbing cutworms and grape flea-beetles, C. R. Phipps (*Missouri Fruit Sta. Circ. 21 (1924), pp. 4, fig. 1*).—Directions are given for the control of these pests, which have been a source of serious injury to vineyards in Newton County.

Parasitic forms of beneficial insects, C. R. Cutright (*Ohio Sta. Mo. Bul., 9 (1924), No. 5–6, pp. 91–95, figs. 5*).—This is a brief popular account of some parasitic forms of Hymenoptera and Diptera.

White ants (termites), R. H. Pettit (*Michigan Sta. Circ. 63 (1924), pp. 2, figs. 2*).—A brief account of the termite *Leucotermes flavipes*, which for several years has been becoming more and more destructive in the North Central States, and of means for its control.

The European elm scale in the West, F. B. Herbert (*U. S. Dept. Agr. Bul. 1223 (1924), pp. 20, pls. 6, figs. 6*).—This is a review of the present status of knowledge of the European elm scale, which was first discovered in the western United States in 1893 at Palo Alto, Calif., where its eradication was attempted but was not entirely successful. Since that time it has spread, until it is now quite generally distributed throughout the western United States. The account includes technical descriptions of its several stages, an account of its life history and habits, control experiments, etc. While a number of sprays have been experimented with, only washing in the spring with a solid stream of water and spraying in the winter with a solution of from 23 to 28° B. miscible oil, 1 part oil to 12 parts water, have proved successful in its control. Investigations of the pest by Doten in Nevada have been noted (E. S. R., 20, p. 655). A list is given of 20 references to the literature.

Pale western cutworm in North Dakota, R. L. Webster and C. N. Ainslie (*North Dakota Sta. Bul. 179 (1924), pp. 24, pls. 2, figs. 6*).—This is an account of observations of the pale western cutworm, which, in addition to having caused serious loss in Montana and Alberta, as previously noted (E. S. R., 46, p. 352; 49, p. 155), has been the source of severe damage, especially to wheat, other small grains, and corn, in several counties of western North Dakota. Its injury in North Dakota was first noticed in 1918, the damage having increased to a marked degree during the succeeding two years. The investigations reported upon were made in severely infested fields during 1921 and 1922. While the amount of damage in the State was small in 1923, there is said to be sufficient reason to believe that outbreaks may be expected, especially in years with deficient moisture in the spring, which checks the growth of crops attacked but which does not check the development of the cutworms.

It is pointed out that eggs are deposited in the fall, usually in wheat stubble fields, where they remain until the larvae hatch out in April. The moths avoid fields the surface of which is crusted over at the time of egg deposition in late August or early September in favor of soil that is loose and mellow in which to deposit their eggs. When summer fallow is kept clean by means of a rod weeder, forming a clod-covered surface, no cutworm damage is likely in that field the succeeding year. Crops following any cultivated crop, such as corn, potatoes, or late millet, are not damaged by this pest, nor are crops following pasture land or land that has been idle the year before likely to be damaged by the cutworm. It is concluded that a cropping system that includes a cultivated crop or summer fallow and a forage crop, such as sweet clover, will reduce and may even eliminate severe damage by this pest. A list is given of 12 references to the literature.

Horse-flies: Biologies and relation to western agriculture, J. L. Webb and R. W. Wells (*U. S. Dept. Agr. Bul. 1218 (1924), pp. 36, pls. 5, figs. 17*).—This is a report of investigations of the conditions favoring and the methods of controlling an abundance of horseflies, which cause serious losses on ranches in Nevada. The studies were commenced in 1915 by the U. S. D. A. Bureau of Entomology in cooperation with the Nevada Experiment Station. The work was carried on in Antelope Valley, which lies partly in California and partly in Nevada, with headquarters at Topaz, Calif. An account is given of the conditions existing in the valley and of rearing methods and equipment, followed by a report in detail upon the species studied, of which *Tabanus punctifer* O. S. (pp. 10–20) and *T. phacnops* O. S. (pp. 20–26) are of greatest economic importance. Other species studied and here reported upon are *T. insuetus* O. S. (pp. 26–29) and a new species described by J. S. Hine as *T. monoensis* (pp. 29–31), while two or three species of the genus Chrysops are said to be common in the region covered by the investigations, but are of less importance than the true horseflies of the genus Tabanus. A technical description of the mature larva of *T. punctifer* is given by A. G. Böving (pp. 14–17). *T. phaenops* is most abundant and therefore of greatest economic importance. Choice breeding places are found on the shores of Alkali Lake in the northwestern part of the valley and the adjacent swampy area, and in wide swampy areas on the floor of the valley formed by irrigation drainage.

Egg masses of *T. punctifer* were found to be attacked by the hymenopteran *Prophanurus emersoni* Gir., practically every egg mass of this species collected having been parasitized. The activity of this parasite is an important factor in the control of *T. punctifer*. The wasp *Bembex primaaestate* J. & R. was also observed to be a predatory enemy. Repellents failed to give protection, and the chances of successfully trapping these species is said to be very remote. It is concluded that drainage will accomplish ultimate control of the pest by removing the breeding places.

Anatomy and metamorphosis of the apple maggot, Rhagoletis pomonella Walsh, R. E. Snodgrass (*Jour. Agr. Research* [*U. S.*], *28 (1924), No. 1, pp. 1–36, pls. 6, figs. 8*).—In this detailed account the author deals with the subject under the headings of the external structure, the tracheal system, imaginal buds, larval pharynx and frontal sacs, alimentary canal and salivary glands, fat body, muscles of the body wall, circulatory system, the nervous system, and the metamorphosis. A two-page summary and a list of 55 references to the literature cited are included.

The cabbage maggot: Its control in the seedbed, H. Glasgow (*New York State Sta. Circ. 76 (1924), pp. 4, pls. 2*).—Directions are given for the control of this pest by the use of the cheesecloth screen, the treatment with corrosive sublimate, and applications of tobacco dust.

[Dusting for the boll weevil at the North Louisiana Station], S. Stewart (*Louisiana Stas. Rpt. 1923, p. 33*).—Tests with the Root Saddle Gun led to the conclusion that its use is very satisfactory where the larger Warlo machine can not be used.

The strawberry weevil, W. J. Baerg (*Arkansas Sta. Circ. 50 (1924), pp. 8, figs. 3*).—A practical account of this pest and means for its control, based upon the studies previously noted (E. S. R., 49, p. 554).

The rose chafer, F. Z. Hartzell (*New York State Sta. Circ. 74 (1924), pp. 4, pls. 2*).—A brief practical summary of information on this pest.

The development of American foulbrood in relation to the metabolism of its causative organism, A. P. Sturtevant (*Jour. Agr. Research [U. S.], 28 (1924), No. 2, pp. 129–168, figs. 17*).—This is a contribution from the U. S. D. A. Bureau of Entomology reporting investigations undertaken with a view to obtaining further information on the growth requirements of the causative organism of foulbrood, with which to explain the differences in the symptoms and development of the American foulbrood and European foulbrood.

It is pointed out that the work of others has shown that the glycogen and fat content of the bee larva increases in a definite manner for a time and then decreases. The work reported has shown that the percentage and amount of reducing sugar likewise increase after the third day of larval feeding, but decrease rapidly immediately after feeding has ceased, until by the eighth day no reducing sugar remains in the larva. The author has found a yeast-extract agar medium to which sterile egg yolk suspension has been added to be the best medium for the growth of *Bacillus larvae*. The optimum reaction for cultural growth is pH 6.8. The incubation period of *B. larvae* is from 24 to 48 hours, so that growth sufficient to kill the larva does not occur until it has completed the spinning of the cocoon and has extended quiescent in the cell, on or after the eighth day, by which time the reducing sugar has disappeared from the larva.

This organism has the power to produce considerable acid, but the H-ion concentration of the decomposing material is not thereby increased, because of the neutralizing effect of protein decomposition products. It not only utilizes reducing sugar for its initial growth, but also completely hydrolyzes the glycogen of the larval body tissues in the process of decomposition. It has the power to decompose nitrogenous materials, with the formation of amino acids, indol, and ammonia, but the H-ion concentration is not decreased by this action because of the concomitant production of acids from carbohydrates. It apparently has no action on fat.

The paper includes a list of 57 references to the literature cited.

Control of the European red mite, C. C. Hamilton (*Maryland Sta. Bul. 264 (1924), pp. 181–238, figs. 8*).—The first part of this bulletin reviews the present status of knowledge of this pest, in connection with a list of 89 references to the literature, including the recent bulletin by Garman (E. S. R., 50, p. 851). This mite was observed in Maryland in a seriously infested orchard at Havre de Grace, in June, 1921.

In the orchards at College Park, the eggs were first observed to hatch about April 15 in 1923, and the first oviposition was noted on May 4. On June

6 eggs were abundant, and a few mites of the third generation had hatched out. The mites were considerably more numerous on June 18, after which time weather conditions unfavorable to them, particularly rain, caused a decrease, and by the end of August few eggs and mites could be found on any of the trees. The weather conditions during the summer of 1922 had been very favorable to mite development. Reference is also made to observations of the pest at Easton and Berlin.

Control investigations, the details of which are presented in part in tabular form, have shown that it is advisable to apply a delayed dormant spray against the winter eggs if present in appreciable numbers on the trees at the time of the winter pruning, since most of the spring and summer sprays used on stone fruits will not give effective control of the summer stages. This should be supplemented by summer control measures in case the mite becomes injurious. Laboratory and field tests have shown that winter eggs can be effectively controlled only by the use of oil sprays, sprays containing sulphur as the active ingredient failing to destroy the winter eggs. In laboratory and field tests the soap oil emulsions, both proprietary and homemade, have given as good control at a dilution of 1 to 33 as most of the miscible oils in dilution of 1 to 15. In addition, the soap emulsions spread better and cost only about one-half as much as the miscible oils.

The summer stages have been effectively controlled on apple trees by the regular spray schedule of lime sulphur 1–40 where the spraying was thorough. If the apple foliage becomes infested with red mites in summer, the trees should be carefully sprayed with lime sulphur 1 part to 75 parts of water. The addition of a spreader, such as casein lime or flour paste, will aid materially in thoroughly wetting the foliage. The recommended sprays for peach trees, such as self-boiled lime sulphur, sulphur lime dry mix, Atomic Sulphur, dusting sulphur, etc., have not given good control. It is pointed out that the lack of effective summer control measures on stone fruits emphasizes the necessity for thorough spraying with an oil spray at the delayed dormant period.

Chicken lice and mites: " Body lice " and " red mites," D. C. KENNARD (*Ohio Sta. Mo. Bul., 9 (1924), No. 5–6, pp. 100–104, figs. 2*).—This is a popular account of these parasites and means for their control.

FOODS—HUMAN NUTRITION.

J. König's chemistry of human foods and condiments.—Supplement to volume 1: (B) Composition of foods and condiments of plant origin, J. GROSSFELD and A. SPLITTGERBER (*J. König's Chemie der Menschlichen Nahrungs- und Genussmittel. Nachtrag zu Band I. B. Zusammensetzung der Pflanzlichen Nahrungs- und Genussmittel. Berlin: Julius Springer, 1923, 4. ed., pp. XX+1216*).—This supplement completes the revision of volume 1 of the handbook previously noted (E. S. R., 45, p. 862), covering the literature on the subjects included through 1922. A concise summary of the properties and occurrence of the vitamins is included.

The twenty-eighth report on food products and sixteenth report on drug products, 1923, E. M. BAILEY (*Connecticut State Sta. Bul. 255 (1924), pp. 163–219*).—In addition to routine analyses of various food products for the purpose of food and drug control (E. S. R., 50, p. 160), a large number of diabetic foods, including many of foreign origin, and vegetable foods of particular interest to diabetics have been analyzed. Descriptions, contributed chiefly by W. A. Orton, of some of the uncommon foodstuffs analyzed are also included. Among these are the Jerusalem artichoke, chayote, the Chinese vegetables kai tsoi and bak toy, palmetto cabbage, pignolia (*Pinus panes*), pistache (*Pistacia vera*), and cashew (*Anacardium occidentale*).

Special attention has also been given during the year to determinations of the lipoid-phosphorus content of commercial flours and egg-flour mixtures as a measure of the amount of egg material contained therein and of the ammonia content of eggs as a measure of their degree of freshness. In regard to the former, it is considered that "if allowance is made for flour containing as little as 0.041 per cent of lipoid-P_2O_5 and for only 90 per cent recovery of the lipoid-P_2O_5 present in the freshly made noodles, a product containing 0.097 per cent lipoid-P_2O_5 would represent a formula calling for 5 per cent of egg solids."

For determining the ammoniacal nitrogen in eggs, a modification of the Folin method was used, the technique of which is described. In a limited number of trials, in which eggs of known freshness were held for 40 days with frequent analyses, the average values for ammoniacal nitrogen in milligrams per 100 gm. of egg were 1.9 between the first and fifteenth day, 2.3 between the twenty-second and thirty-second day, and 2.9 between the thirty-third and fortieth day.

Food for health's sake: What to eat, L. H. GILLETT (*New York and London: Funk & Wagnalls Co., 1924, pp.* [*5*]+*47*).—This popular presentation of the essentials of human nutrition and the proper choice of foods is one of a series of 20 books on various phases of human health, edited by The National Health Council and to be known as The National Health Series. The introduction to the present volume is by H. C. Sherman.

Meat for health (*Chicago: Natl. Livestock and Meat Bd., pp. 30, figs. 4*).—"A discussion of the food value and healthfulness of meat, with suggestions for the selection, preparation, and cooking of the various cuts, and more than 80 recipes for appetizing and economical meat dishes."

Making a nutritionally balanced bread, C. O. JOHNS, A. J. FINK, and D. B. JONES (*Amer. Food Jour., 18 (1923), No. 8, pp. 394–396, figs. 2*).—The formula of the bread described, a public service patent for which has been issued, is as follows: Wheat flour 300, peanut or soy bean flour 100, table salt 6, calcium hydrogen phosphate ($CaHPO_4$) 6, butter 20, and compressed yeast 10 gm., with water 228 cc. This formula is based on the results of previously noted studies on the nutritive value of peanut flour (E. S. R., 43, p. 763) and soy bean flour (E. S. R., 45, p. 664) as supplements to wheat flour.

Diet in relation to reproduction and rearing of young, L. T. ANDEREGG (*Jour. Biol. Chem., 59 (1924), No. 3, pp. 587–599*).—The literature on the failure of reproduction on various synthetic diets is reviewed, and experimental work is reported from which the conclusion is drawn that the failures discussed were due to improper proportions of the various known food constituents rather than to the lack of a specific vitamin for reproduction as suggested by Evans and Bishop (E. S. R., 48, p. 864).

In the experiments reported, whole milk powder was used as the sole source of proteins and vitamins, with control experiments in which the rations contained various supplements such as washed casein, salt mixture, agar, etc. The experiments were carried into the third generation when possible and the records of growth and reproduction compared with normal.

When the diet contained whole milk powder as the sole source of protein and vitamins the rats grew at a normal rate and were not sterile. The results obtained with the different combinations varied widely. On a diet containing 70 per cent of whole milk powder with dextrin, agar, and iron citrate, fourth generation animals were reared but there was a high mortality, and while each litter contained the usual number of young there was a tendency to smaller numbers of litters. On a diet containing 60 per cent of whole milk with the other ingredients mentioned above the animals appeared to be in better condition and the mortality was very low. Better results were obtained on diets containing a varied salt mixture than on those furnishing iron citrate as the only salt.

On a diet consisting of skim milk powder 90, agar 4.8, butterfat 5, and iron citrate 0.2 per cent there was normal growth but no reproduction, and the same was true of a diet furnishing whole milk powder 50, starch 38, lard 10, and salt mixture 2 per cent. On a diet identical with the last-mentioned with the exception that some of the fat had been replaced by dextrin and agar, the first litters were successfully weaned. These and other similar results are thought to indicate that the ratio of fat to protein should be kept within certain limits if optimum results are to be expected.

Other points brought out in the records obtained with the various types are that the amount of salt mixture the animal can tolerate is dependent on the nature and the amount of the protein in the diet, and that too rapid growth may result in failure of reproduction.

An additional study of growth and reproduction on diets containing varying amounts of casein as a sole protein showed that at a 15 per cent level practically all of the young were reared, but that above 20 per cent mortality was greatly increased.

A study is also reported of the relation of the quantity of wheat embryo as a source of vitamin B to growth, reproduction, and rearing of the young. When this was used at a level of 6 per cent or below, the mortality of the young was 100 per cent, while at higher levels the number of young reared appeared to be directly proportional to the amount of wheat embryo used. "Future experiments will reveal whether the results obtained are to be ascribed to difference of level of vitamin B or to a new dietary factor, the nature of which is unknown."

The effect of prolonged fasting followed by realimentation on gastric secretion, M. M. Kunde (*Amer. Jour. Physiol., 68 (1924), No. 2, pp. 389–396, figs. 2*).—The author's investigation of the effects of fasting upon the nutritive condition of the body (E. S. R., 51, p. 67) has been extended to a study of the amount and acidity of the gastric juice of two Pavlov pouch dogs during realimentation following prolonged fasting.

There was no increase in the continuous gastric secretion or in the acidity of the secretion of the two dogs during the 27 days of fasting. During the realimentation after fasting, both animals showed an increase in the continuous secretion and a decrease in the psychic secretion, i. e., the amount secreted during the first three hours after feeding. This inhibitory effect of intense hunger on the so-called appetite juice was also shown by the fact that during the period of fasting the sight or smell of food did not stimulate the gastric secretion. The amount of gastric juice secreted from the fourth to the ninth hour after food and for from one to four hours after water was much greater than before fasting. This persisted from 4 to 6 weeks after breaking the fast.

The digestibility and efficiency of the protein of toast in adult human nutrition, M. M. Kramer and E. St. John (*Jour. Home Econ., 16 (1924), No. 6, pp. 307–309*).—A brief report is given of metabolism experiments conducted on two young women for nine consecutive three-day periods, preceded by a foreperiod of two days, to determine the relative digestibility of the protein of white bread and of toast prepared from the same bread. The diet consisted of white bread, toasted or untoasted, with butter and raw apples in amounts sufficient to meet the energy requirement of the subjects and to furnish 95 per cent of the protein as bread protein. The bread was eaten untoasted in the first, second, and last periods and as crisp dark brown toast in the intervening six periods.

The tabulated data on nitrogen intake and output in urine and feces showed that the heat of the toasting process did not render the protein less digestible, no appreciable differences in the nitrogen balance for the different periods being noted. The nitrogen balances were slightly negative in all cases. One subject was able to establish nitrogen equilibrium for 15 out of 18 days when the diet furnished an average of 37.6 gm. of protein per 70 kg. of body weight, but when the untoasted bread was substituted there was a slight increase in the negative balance.

Synthesis of amino acids in the animal organism.—III, Concerning the synthesis of cystine in the body of the dog, J. A. Muldoon, G. J. Shiple, and C. P. Sherwin (*Jour. Biol. Chem., 59 (1924), No. 3, pp. 675–681*).—Following the general methods employed in previous studies of this series (E. S. R., 49, p. 661), the authors have approached the question of the synthesis of cystin in the animal organism by determining whether it can be synthesized in dogs under the stress of bromobenzene poisoning. Three experiments were carried out. In the first a dog maintained on a carbohydrate diet was fed bromobenzene, together with sodium sulphate, potassium thiocyanate, calcium sulphid, taurin, cystin, and ethyl amino mercaptan on different days. In the second the same materials were fed as in the first, with the addition of sufficient ammonium carbonate or acetate to furnish nitrogen in case it should prove the limiting factor. In the third gelatin was substituted for the ammonium salts. The same dog was used throughout the different experiments.

In spite of the fact that the sulphur furnished during the feeding period was always more than twice the amount necessary for the synthesis of sufficient cystein for the detoxication of the amount of bromobenzene furnished and that the amount of nitrogen furnished, either as ammonium salts or gelatin, was several times the amount required for the cystein synthesis, bromophenyl mercapturic acid was found only after the feeding of cystin, thus proving the inability of the animal organism to synthesize this amino acid from either reduced or oxidized sulphur in the presence of sufficient nitrogen.

Amino acids in nutrition.—VIII, Proline is indispensable for growth, B. Sure (*Jour. Biol. Chem., 59 (1924), No. 3, pp. 577–586, figs. 8*).—The evidence upon which the author bases his conclusion that prolin is indispensable for growth is an outcome of the previous study (E. S. R., 47 p. 660) in which it was shown that cystin and lysin are capable of supplementing the protein deficiencies of edestin if gelatin is present. Since gelatin contains an abundance of prolin and arginin it was thought that the supplementary value of prolin could be tested by employing edestin at different levels, supplemented with cystin and lysin, as the basal protein in the usual rat-feeding experiments and noting any difference in growth on the further addition of prolin or of prolin in the presence of arginin.

When edestin was fed at a 9 per cent level there was no particular improvement, but when fed at a 6 per cent level there was a decided improvement in growth on the addition of 0.4 per cent of prolin. After a 12-week period two of the animals, however, showed no better growth than on the control diet without prolin. The addition of 0.4 per cent of arginin caused a marked improvement, although arginin without prolin was without effect.

An observation on the value of egg-white as the sole source of nitrogen for young growing rats, M. A. Boas (*Biochem. Jour., 18 (1924), No. 2, pp. 422–424, figs. 2*).—Contrary to the results reported by Bond (E. S. R., 48, p. 63), the author has found egg white to be an unsatisfactory protein for the growth of young rats when fed at a 20 per cent level. The ration consisted of egg white (the same commercial preparation of Chinese origin as that used by Bond) 41 gm., wheat starch 113, marmite 12, hardened cottonseed oil 30, salt mixture 3.5, and ferric citrate 0.14 gm., with orange juice 12 and distilled water 93 cc. From 3 to 5 drops of cod liver oil was given each rat daily to supply fat-soluble vitamins. On this diet young rats grew well for from 4 to 6 weeks, after which loss of hair occurred and the weight remained stationary for a time and then fell. The substitution of caseinogen or serum albumin for the egg white or the addition of 5 gm. daily of spinach or 5 cc. of fresh milk cured the condition.

The participation of inorganic substances in carbohydrate metabolism, G. A. HARROP, JR., and E. M. BENEDICT (*Jour. Biol. Chem., 59 (1924), No. 3, pp. 683–697, figs. 2*).—The authors present data obtained in experiments planned to test the validity of the hypothesis that an intermediary phosphate compound is formed during the conversion of glucose into muscle tissues or during the oxidation of glucose, and that this involves a transfer of inorganic phosphate from the blood into the muscle tissues, followed by a gradual restoration of the normal blood phosphates and an increase in the urinary phosphate. The lines of evidence pointing to the validity of this hypothesis are as follows: Analyses following insulin injection of the blood serum of patients in severe diabetes showed a drop in the concentration of the serum inorganic phosphate and of the serum potassium but no change in sodium. Similar analyses of the blood of rabbits fasted for 48 hours showed a similar fall in concentration of serum phosphates and potassium following insulin injection and an increase in both following strychnin convulsions.

The urinary excretion of phosphates and potassium in a diabetic patient receiving insulin for the first time showed a reduction during the hours in which the insulin was actively influencing the metabolism and an increase during the following night after the effect of the insulin was ended. The excretion of potassium showed the same variation.

Determinations of phosphates in the muscles of rabbits before and after insulin injection showed an increase in the total organic phosphate fraction at the height of the insulin effect.

Determinations of the serum phosphate in three normal subjects before and after the ingestion of large amounts of glucose showed a drop in the concentration of phosphates occurring simultaneously with the increase in blood sugar concentration.

"All the data presented are consistent with the assumption that in the storage of carbohydrate as glycogen, the intermediary aid of organic phosphates is required. This aid would appear to be, at least to a considerable degree, temporary in nature, because at the end of the active stage of carbohydrate anabolism the retained phosphate is again released."

The metabolism of sulfur, VII, VIII, R. M. HILL and H. B. LEWIS (*Jour. Biol. Chem., 59 (1924), No. 3, pp. 557–575*).—Continuing the series previously noted (E. S. R., 51, p. 561), two papers are presented.

VII. *The oxidation of some sulfur compounds related to cystin in the animal organism.*—A study is reported of the oxidation in rabbits of three sulphur-containing compounds closely related to cystin and cystein—thiolactic acid, thioglycollic acid, and thiodiglycollic acid—the first two containing the sulphur in the mercaptan linkage C-SH and the last in the sulphid linkage C-S-C. Of these the first two were readily oxidized when administered to rabbits either subcutaneously or by mouth. The first was nontoxic but the second was toxic. Thiodiglycollic acid was not toxic and was not oxidized. "It seems probable that of the different types of organic sulphur compounds, only those containing the mercapto group or those which can readily be transformed in the organism into compounds containing this group are oxidized with ease in the animal organism."

VIII. *The behavior of thiophenol and thiocresol in the animal organism.*—The sulphur compounds tested in this study were two containing mercapto groups attached to the benzene ring—thiophenol, $C_6H_5.SH$ and *p*-thiocresol, $CH_3.C_6H_4.SH$. Both of these were toxic, and there was no evidence of oxidation of the sulphur of the mercapto groups to sulphate sulphur.

The part played by iron and fat in the recovery of rats from chronic experimental anaemia, J. M. D. Scott (*Biochem. Jour., 18 (1924), No. 2, pp. 347–350*).—The author discusses briefly factors influencing the absorption of iron and the recovery from simple anemia as illustrated by experiments conducted on rats on a bread and milk diet (E. S. R., 50, p. 262), and presents data showing the effect of inorganic iron and of inorganic iron plus palm kernel oil on blood regentration in anemic rats.

In the first series the addition of 20 mg. daily of ferrous chlorid to a diet of bread and milk from the age of 8 weeks brought about complete recovery by the end of the sixteenth week, at which time the average hemoglobin count of the blood was 99 per cent as compared with 55 per cent for the controls on the bread and milk without iron. In the experiments in which 20 mg. of ferrous chlorid and 2 gm. of palm kernel oil were given daily to anemic rats, at 20 weeks of age the percentage of hemoglobin was 60 as compared with 98 per cent for controls on bread and whole milk with ferrous chlorid.

The author concludes that the anemia discussed is due to lack of iron in organic or inorganic form, but that the administration of iron is without avail for its cure if the diet is otherwise inadequate, particularly with respect to milk fat or something associated with it which is necessary for blood regeneration. This deficiency is not supplied by a vitamin-free fat such as palm kernel oil.

The fat-soluble vitamin in relation to health, H. C. Sherman (*Nation's Health, 5 (1923), No. 10, pp. 682, 683, 744, 746*).—This is a brief discussion, with references to the literature, of the physiological significance of vitamin A.

Studies of the vitamin potency of cod-liver oil.—VI, The effect of storage of livers on the vitamin A potency of cod-liver oil, A. D. Holmes (*Indus. and Engin. Chem., 16 (1924), No. 3, pp. 295–297, figs. 3*).—Data are reported on the chemical and physical characteristics and vitamin A content of samples of cod liver oil obtained from fresh livers and from the same livers after storage in glass containers in the ice box for 6 and 12 months, respectively.

Of the constants determined, the acid value showed marked differences as follows: Fresh oil 0.5903, oil from livers stored for 6 months 15.56, and oil from livers stored for 1 year 18.07 per cent. The color of the oil tended to change from a straw yellow to a red with increasing periods of storage. The method of testing for vitamin A was the same as in previous papers of the series (E. S. R., 50, p. 858). From 7 to 10 rats were used for each of the three grades of oil, which was fed in amounts varying from 0.24 to 4.8 mg. daily. No deterioration in potency of the oil was evident as the result of storage. In fact the oil stored for 1 year appeared to be even more potent than fresh oil. One mg. per day of each of the oils contained sufficient vitamin A for good growth.

Studies of the vitamin potency of cod-liver oil.—VII, The vitamin A potency of hake-liver oil, A. D. Holmes (*Indus. and Engin. Chem., 16 (1924),* *No. 4, pp. 379, 380, fig. 1*).—Data are reported on the chemical characteristics and content of vitamin A of crude hake liver oil prepared by the author from fresh livers obtained from fish in prime condition. The analytical constants of the oil are as follows: Specific gravity at 25° C. 0.9191,, refractive index at 20° 1.4757, saponification value 185.9, iodin number 134.1, acid value 0.5458, and clouding point 25° C. The estimated amount of the oil to furnish sufficient vitamin A for growing rats is 0.8 mg. daily.

The effect of light on the organism, W. CRAMER and A. H. DREW (*Brit. Jour. Expt. Path., 4 (1923), No. 5, pp. 271–282, figs. 5*).—Rats were kept in the dark from birth on a diet containing a constant amount of vitamin A just sufficient to maintain health under ordinary conditions, and at the age of three or four months their blood was examined for platelet count and number of red cells. Of the seven rats examined, all but one had a greatly lowered platelet count. The rats with the subnormal count were then exposed to the light of a mercury vapor lamp from 3 to 5 minutes each day for from 14 to 25 days, after which blood platelet counts were again made. In every case there was a decided increase in the number of platelets, which was greatest in the animals which had received the longest exposure to light. In three rats which had shown signs of anemia this had disappeared during the treatment.

The conclusion that light has a stimulating effect on the formation of blood platelets was tested further by studying the effect of ultraviolet light on the platelets of rats kept on a diet deficient in vitamin A. In the first series, two rats taken from litters which had been kept from birth on a vitamin-rich diet were fed a vitamin A-deficient diet, and one was exposed daily for seven weeks to ultraviolet light while the other received no treatment. At the end of this time the conditions were reversed and the experiment continued for four weeks. The blood platelet counts of the rats receiving light treatment for the first period, at the end of the first, seventh, and eleventh weeks were 750,000, 728,000, and 666,000 per cubic millimeter. Corresponding figures for the other rats were 890,000, 546,000, and 830,000.

In the second series, three rats from litters on a vitamin-rich diet were placed on the vitamin A-free diet and after eight weeks, when all showed marked thrombopenia, two were given ultraviolet light treatment and the third left as control. The lower blood platelet count which all showed at the beginning of the light treatment increased rapidly in the two receiving treatment and was maintained at the same level in the other.

In a third series, three rats which had been kept on the low vitamin laboratory diet were placed on the deficient diet, one receiving the deficient diet from the start until the ninth week and the other two not until the fifth week. The latter developed eye lesions in the sixth week, while the other remained free from eye trouble.

In discussing these results the conclusion is drawn that "light is a stimulus to the formation of blood platelets. This explains the partial antagonism between vitamin A deficiency and exposure to light: Light can counteract the one lesion—thrombopenia—produced by vitamin A deficiency, but can not prevent the eventual atrophy of the intestinal mucous membrane. Exposure to light can therefore delay but can not prevent the eventual cessation of growth and the eventual onset of bacterial infections resulting from the vitamin A deficiency. Absence of light accelerates the onset of these conditions. Light is, however, not an essential condition for the formation of platelets, and its absence can be counteracted so far as the platelets are concerned by an abundant supply of vitamin A."

Note concerning the deficiency in vitamin A in the pigeon [trans. title], J. Hoet (*Biochem. Jour., 18 (1924), No. 2, pp. 412, 413*).—This is a brief note to the effect that, on continuing the investigation previously noted (E. S. R., 50, p. 264), the pigeons, which up to six months had shown no ill effects from a diet deficient in vitamin A, soon after developed symptoms of leg weakness. One died a few weeks later, and the others remained in poor condition until the ration was changed to ordinary corn. In 10 or 12 days all had recovered from the leg weakness. It is also noted that during the entire time of the experiment eggs were laid by only three pigeons. Some of these eggs were infertile, and none of the young lived more than 5 days.

The author concludes that, contrary to his previous belief, vitamin A is necessary for pigeons.

The depletion of vitamin C in the liver of the guinea pig on a scorbutic ration, H. T. Parsons and M. S. Reynolds (*Jour. Biol. Chem., 59 (1924), No. 3, pp. 731–736, figs. 2*).—The livers of guinea pigs on diets rich and lacking in vitamin C have been tested for their content of vitamin C by the methods used in a previous study of the livers or rats (E. S. R., 51, p. 569).

In the livers of normal guinea pigs vitamin C was present in abundance, the amount being comparable with that found in rat liver. The livers of the guinea pigs on the scorbutic ration contained inappreciable amounts of vitamin C., a result in marked contrast with the results obtained on rats. This is thought to indicate, as suggested in the first report of the series (E. S. R., 44, p. 862), that the rat produces vitamin C in metabolism from some source not available to the guinea pig.

Rice in relation to beriberi in India, R. McCarrison (*Brit. Med. Jour., No. 3297 (1924), pp. 414–420, figs. 5*).—This is a general discussion, based upon the author's extensive investigations, of tropical beriberi as it occurs endemically in India. The distribution of the disease as correlated with the extent of rice cultivation and the kind of rice used is first discussed, and it is shown that, while undermilled and parboiled rice apparently afford protection against beriberi outside the endemic zone, they do not alwayes protect against it within the endemic zone. "It would seem that residence in an endemic locality imparts to certain individuals a susceptibility to the disease which favors its development under conditions of life—faulty food, imperfect hygiene, overexertion, hardship, cold, and damp—that do not suffice to cause it in others not rendered susceptible to it by such residence."

Data are reported on the nutritive and vitamin value of a large number of rices in common use in India in the various forms of raw, parboiled, polished, and unpolished. Two series of experiments contributed to the data. In one adult pigeons in groups of six were fed the rice as the sole ration, and the loss and gain in weight were recorded, together with the time of the development of polyneuritis. In the other the nutritive value of 30 samples of paddy and rice were compared with one another and with mixed grains by feeding experiments conducted on young pigeons. Each sample furnished the exclusive food of a group of six young pigeons of approximately the same age and strain and obtained from the same locality. While in general, as was to be expected, the unmilled and parboiled rice proved superior to the milled and polished rice, the data show that few of the rices in common use in India were entirely devoid of vitamin B, and that the ones known to have been used by sufferers from beriberi were not always those most deficient in vitamin B.

In discussing the observations as a whole, the author states that he has produced in pigeons by means of rice no less than four beriberi-like diseases:

(1) "Infective polyneuritis, due to infection, but favored in its genesis by vitamin deficiency; (2) polyneuritis due to vitamin deficiency alone; (3) polyneuritis due to vitamin deficiency, but precipitated in its onset by various infections; and (4) a malady presenting the characteristics of true beriberi, and due to an unknown agent acting in association with insufficiency but not complete want of vitamins." It is suggested that there may be a similar variety of berberi-like maladies in man.

The value of milk acidified with lemon juice.—Its combination with egg yolk to add the antirachitic factor, A. F. HESS and M. J. MATZNER (*Jour. Amer. Med. Assoc., 82 (1924), No. 20, pp. 1604–1606, figs. 2*).—In view of the fact that various forms of acid milk are readily digested by infants and are being widely recommended for infant feeding, the authors have conducted experiments in the use of tomato juice, orange juice, and lemon juice as the acidifying agent with a view to bringing the H-ion concentration of the milk to the desired value and at the same time increasing the vitamin C content of the milk.

Tomato juice and orange juice proved unsatisfactory, in that excessive amounts were required to overcome the buffer action of the milk and bring it to the desired pH, but lemon juice was very satisfactory. The addition of 21 cc. of lemon juice to 1 liter of milk changed the H-ion concentration from pH 6.64 to 5.54 and of 28 cc. to pH 5.35. In preparing the milk mixture with undiluted milk the lemon juice is added drop by drop; but if a diluted formula is used, the lemon juice is added to the water or other diluent and this in turn to the milk. Under these conditions the lemon juice does not curdle the milk and changes its flavor only slightly. Infants from 2 to 15 months of age have been fed milk prepared with lemon juice for long periods with no digestive disturbances and with steady gain in weight.

Milk mixtures have also been prepared with both lemon juice and egg yolk, the latter to improve the antirachitic value of the milk, as suggested in a previous paper (E. S. R., 50, p. 165). For infants as young as six weeks of age the egg is added in the proportion of half a yolk to a quart of milk mixture and for others in the proportion of one yolk to a quart. This addition is of further value in supplementing the low iron content of milk.

The calcium content of breast milk in relation to rickets, L. R. DEBUYS and L. VON MEYSENBUG (*Amer. Jour. Diseases Children, 27 (1924), No. 5, pp. 438–443*).—The breast milk of 19 mothers with normal and 51 with rachitic babies was analyzed for calcium by the Clark direct precipitation method (E. S. R., 47, p. 14), with the following minimum, maximum, and average results: Normal milk 23.7, 40, and 32.6 mg. per 100 cc. and rachitic milk 18.4, 39.6, and 27.5 mg. Grouped according to age of the infant, the results showed a decreasing calcium content as lactation progressed. Grouped according to white and colored mothers, the calcium content of the milk of the white women averaged 31.1 and of the colored 27.3 mg. per cubic centimeter.

It should be noted that all of the babies were receiving a daily ration of cod liver oil emulsion.

Experimental rickets in rats on a purified synthetic diet deficient in phosphorus and fat-soluble organic factor, H. GOLDBLATT (*Biochem. Jour., 18 (1924), No. 2, pp. 414–418*).—Data are presented showing that the addition of suitable amounts of calcium carbonate to the low phosphorus, low fat-soluble vitamin diet described by Korenchevsky as not inducing rickets in rats (E. S. R., 46, p. 568) changed the diet from nonrickets-producing to rickets-producing. The amounts of calcium carbonate added were such as to change the proportion of calcium to phosphorus from 1:0.88 to 1:0.2.

The supposed influence of irradiated air on growth, T. A. Webster and L. Hill (*Biochem. Jour., 18 (1924), No. 2, pp. 340–346, figs. 4*).—An extension of a previously reported study of the alleged growth-promoting effect of irradiated air (E. S. R., 51, p. 270) is reported, with results which are summarized as follows:

"In no case have we been able to confirm the results of Hume and Smith [E. S. R., 50, p. 265] regarding the growth-promoting effects of irradiated air, and we have come to the definite conclusion that it has no effect on growth, nor do we see any possible a priori reason why it should have an effect on growth.

"A daily exposure of 15 minutes to the rays of a 3.5-ampere lamp at a distance of 2 ft. appears to have some stimulating effect on the growth of young rats on a diet deficient in vitamin A, but a daily exposure of 10 minutes to a 2-ampere lamp apparently has no effect on growth, although it exercises a considerable effect on the calcium and phosphorus metabolism. Evidently the ultraviolet rays do not stimulate growth by preventing rickets, as suggested by Steenbock and Nelson [E. S. R., 50, p. 364]. The radiant energy necessary to promote growth appears to be other than that required to cure rickets."

ANIMAL PRODUCTION.

Report on inspection of commercial feeding stuffs, 1923, E. M. Bailey et al. (*Connecticut State Sta. Bul. 257 (1924), pp. 320–359*).—This is the usual report (E. S. R., 50, p. 169) of the inspection of commercial feeding stuffs officially analyzed, with other information relating to the feeding stuffs law and the composition of feeding stuffs.

Ensiling versus drying soft ear corn, J. M. Evvard, A. R. Lamb, and E. J. Maynard (*Iowa Sta. Bul. 216, abridged ed. (1923), pp. 4*).—This is an abridged edition of the bulletin previously noted (E. S. R., 50, p. 64).

The effect of varying feed levels on the physiological economy of steers, E. G. Ritzman and F. G. Benedict (*New Hampshire Sta. Tech. Bul. 26 (1924), pp. 3–34*).—This is a more popular report of the experiments previously noted (E. S. R., 50, p. 670), dealing mainly with the results of this investigation which have a more definite bearing on economic practice.

Fattening cattle [at the Indiana Station] (*Indiana Sta. Rpt. 1923, p. 14*).—In one steer fattening trial whole soy beans, whole soy beans and minerals, and soy bean oil meal produced as rapid and economical gains as cottonseed meal. In comparing heavy with light cattle, less rapid gains but little difference in the cost of gains were made with 770-lb. cattle roughed for 80 days as compared with 950-lb. cattle fed corn from the beginning of the test. In testing the economy of cottonseed meal for fattening 2-year-old steers, larger profits were produced when cottonseed meal was not fed, but with lighter cattle the cottonseed meal has been found to be profitable.

[Beef cattle experiments at the Nebraska Station] (*Nebraska Sta. Rpt. [1923], pp. 23, 24, 38*).—The results of experimental work with beef cattle are briefly noted.

Effect of age upon rate and economy of gain.—The third year's trial of this experiment (E. S. R., 49, p. 772), with 4 lots of 10 steers each ranging in age from calves to 3- and 4-year-olds, have yielded results very similar to those of the previous trials. The steers were fed for 200 days, beginning October 31, 1922, on shelled corn and alfalfa hay. The gains of all groups were slightly over 2.5 lbs. per day, the calves making more economical gains, due to a smaller feed consumption.

Baby beef.—In an experiment using 6 lots of 16 calves each during a 175-day feeding period, the economy of gain on various rations by steer and heifer calves was compared. The cheapest and most profitable ration proved to be shelled corn and alfalfa hay. The addition of 1.1 lbs. of linseed meal daily to this ration decreased the profit, though the gain and selling price were increased. Oats and ground corn were not so satisfactory as shelled corn. The steers gained more rapidly and sold for higher prices than the heifers.

Sweet clover and native pasture.—In this test at the Scottsbluff Substation 3 lots of 25 3-year-old steers each averaging 757 lbs. were pastured during the season as follows: One lot on sweet clover, with the additional feeding of corn up to 20 lbs. per head daily at the end of the period; 1 lot on sweet clover only; and 1 lot on native grass pasture only. The average gains per steer during the season in the respective lots were 255, 133, and 225 lbs.

[Experiments with beef cattle at the North Dakota Station], J. H. SHEPPERD, F. W. CHRISTENSEN, and A. C. KUENNING (*North Dakota Sta. Bul. 174 (1924), pp. 18, 19, 24–26, 27, 95*).—The following experiments have been conducted with beef cattle:

Native pasture.—The results of 7 years' work in cooperation with the U. S. D. A. Dry Land Station at Mandan, using 350 head of cattle, have shown that 5 acres of native pasture are not sufficient to carry a 2-year-old steer. Seven acres were sufficient, however, and 10 acres have been found to furnish an oversupply. Letting the grass get a good growth in the early spring and rotating between pastures have been found to increase the carrying capacity. Observations on grazing cattle have shown that the distance traveled has a distinct relation to the size of the pasture and that the amount of time wasted and the diligence with which steers graze and ruminate is subject to much variation. The number of jaw wags per bolus varied from 31 to 50.

Sweet clover pasture.—A 4-acre piece of yellow and white sweet clover was found to have an average carrying capacity per acre of 1.95 head of cattle from May 10 to August 30. The average daily gains per head made on this pasture were 1.94 lbs. The white blossom clover started growth earlier in the spring and grew longer than the type with the yellow blossom. Cattle were found to require 15 days to get accustomed to the sweet clover. An unexpected result was the seemingly greater palatability of the coarser stems than of the younger foliage.

Digestibility of prairie hay.—The results of a continuation of this study have been in accord with those previously noted (E. S. R., 48, p. 69).

Silage feeding experiments.—Another year's results of this experiment have been generally in agreement with those previously noted (E. S. R., 49, p. 869). Corn silage was distinctly superior to the other types used because of its palatability and the production of larger gains and better finish in the steers.

[*Pasturing steers at the Williston Substation*].—Twenty-four steers pastured on native grass from May 1 to September 24, 1921, made average daily gains of 2.28 lbs. per steer during the period. In a succeeding 68-day feeding period on dry feed, corn fodder, Sudan hay, and oat straw they made average daily gains of 0.44 lb.

Market classes and grades of dressed beef, W. C. DAVIS and C. V. WHALIN (*U. S. Dept. Agr. Bul. 1246 (1924), pp. 48, pls. 34*).—This bulletin deals with the distinguished characteristics of the various grades and classes of beef carcasses and the wholesale cuts made from them. The approximate percentage of the carcasses represented by the wholesale cuts when cutting by different methods is tabulated.

Experiments with sheep [at the North Dakota Station], D. J. Griswold and A. C. Kuenning (*North Dakota Sta. Bul. 174 (1924), pp. 22, 23, 95*).—The following experiments with sheep have been carried on at the station and the Williston Substation:

Breeding ewe lambs.—Six ewe lambs bred to lamb in June seemed to develop as well as 6 others that were not bred. The lambs dropped, however, were at one year of age smaller than earlier lambs from older ewes even when the age was considered.

Lambs grazing in corn field.—Sixty-eight spring lambs receiving a ration of 0.73 lb. daily of a grain mixture of cracked corn, whole oats, and wheat bran, 4:2:1, and turned into a cornfield on July 28, made average daily gains of 0.4 lb. during the succeeding 12 days.

"Hogging off" corn with lambs.—Sixty spring lambs averaging about 75 lbs. in weight made average daily gains of 0.244 lb. during a 49-day test in hogging off corn. They consumed an estimated average of 9.7 lbs. of grain per pound of gain.

Sheep [at the Williston Substation].—A flock of Hampshire sheep proved to be effective gleaners of the growth along irrigation canals and produced in 1922 an average of 8 lbs. of wool per head.

Lamb feeding [at the Indiana Station] (*Indiana Sta. Rpt. 1923, p. 13, fig. 1*).—Whole soy beans, cottonseed meal, soy bean oil meal, and whole soy beans with minerals have shown practically equal values as supplements to a ration of shelled corn, clover hay, and corn silage for fattening lambs. Self-feeding lambs on corn and cottonseed meal produced more rapid but also more expensive gains than hand-feeding. Six per cent of the lambs died from overeating when first placed on the self-feeders.

Ear corn as compared with shelled corn produced as rapid and more economical gains. Corn silage in a ration with corn, cottonseed meal, and clover hay produced more rapid and more economical gains and better finish than corn stover.

[Hog feeding investigations at the Idaho Station] (*Idaho Sta. Bul. 133 (1924), p. 10*).—In two tests with 75 hogs weighing about 125 lbs. each, in which various rations were compared, it was found that the following amounts of feed were required per 100 lbs. of gain: Peas 370 lbs., peas and barley 400, barley and tankage 425, and corn and tankage 410 lbs.

Hog feeding [at the Indiana Station] (*Indiana Sta. Rpt. 1923, pp. 11, 12, fig. 1*).—The results of several hog feeding experiments are briefly summarized, most of which are in continuation of those previously noted (E. S. R., 49, p. 571). Tests so far indicated the necessity of protein supplements and minerals to corn either fed in dry lot or hogged down for fattening swine.

Spring pigs have been found to require an equal amount of feed for fattening whether fed heavily for the early fall market or fattened more slowly for later marketing. Rations well supplemented with protein and minerals are necessary to fatten pigs in time for the fall market before prices drop.

Alfalfa pasture has been found to furnish a more constant forage supply than clover, though high values for both have been demonstrated in the experiments conducted. Rape has also been found to make a satisfactory substitute for clover and alfalfa when the latter are not availble.

[Hog feeding experiments at the Nebraska Station] (*Nebraska Sta. Rpt. [1923], pp. 24, 25, 33, 38, 39*).—The feeding experiments with swine have been largely continuations of those previously noted in annual reports (E. S. R., 49, p. 775).

Rations for fattening hogs.—In tests of comparative rations for fattening hogs, the following amounts of feed were required in a 70-day test to produce

100 lbs. of gain on 110-lb. pigs: 370 lbs. of yellow corn and 41 lbs. of tankage, 393 lbs. of white corn and 52 lbs. of tankage, 383 lbs. of mixed corn and 51 lbs. of tankage, and 454 lbs. of ground barley and 50 lbs. of tankage. In a 76-day test, 6 lots of 12 pigs each were used in comparing white and yellow corn with tankage supplements for fattening pigs. The average daily gains were 1.47 lbs. on the yellow corn and 1.36 lbs. on the white corn. When the yellow corn was used, 388 lbs. of corn and 105 lbs. of tankage were required to produce 100 lbs. of gain, while 429 lbs. of white corn and 101 lbs. of tankage were required to produce an equal gain.

Experiments with hogs at the North Platte Substation.—Rations of yellow and white corn with tankage and alfalfa supplements were compared, using 2 lots of 10 pigs on each ration. The average daily gains were 1.61 lbs. with white corn, 1.58 lbs. with yellow corn, and 1.63 lbs. with yellow and white corn mixed, while the amounts of corn and tankage required per 100 lbs. of gain for the respective lots were 340.4, 338.9, and 347.9 lbs. In another test, lots of 15 80-lb. pigs pasturing on Sudan grass and receiving yellow or white corn made average daily gains of 1.3 and 1.28 lbs., respectively, while 381.9 lbs. of white corn and 402.2 lbs. of yellow corn were required to produce 100 lbs. of gain. Another lot also pastured on Sudan grass, but receiving tankage, made average daily gains of 1.54 lbs. A lot receiving yellow corn and alfalfa pasture gained an average of 1.51 lbs. per day, requiring 359.3 lbs. of corn per 100 lbs. of gain.

[*Hog feeding experiments at the Scottsbluff Substation*].—In a comparison of summer and winter finishing of fall pigs, the summer finishing on pasture yielded an estimated profit, while finishing in the winter was done at a loss. A comparison of self-feeding and hand-feeding rations of corn and barley was made with 2 lots of 37 pigs each during a 136-day test. The lot receiving the grain in a self-feeder made a total gain of 4,095 lbs., while those receiving a 2 per cent ration of grain gained 2,995 lbs. The estimated profits per hog were —25 cts. for the former lot and +50 cts. for the latter.

In a 57-day test tankage and alfalfa hay were compared as supplements to corn. The lot (35 pigs) on corn and tankage gained 2,210 lbs., while the other lot gained 1,645 lbs. The calculated costs per pound of gain were 6.76 and 6.72 cts.

[Swine feeding experiments at the North Carolina Station], E. H. Hostetler et al. (*North Carolina Sta. Rpt. 1923, pp. 12, 15–17, 61, fig 1*).—Many of the experiments conducted with swine were continuations of those noted from a previous report (E. S. R., 49, p. 775). At the Black Land Substation, Wenona, corn fed to hogs brought $1.10 per bushel, while its value on the market was only 65 cts. per bushel. Fish meal and shelled corn produced gains at somewhat less cost than tankage and corn in these experiments.

At the Upper Coastal Plain Substation two tests dealing with the pork-producing value of sweet potatoes were conducted. In the first experiment culled sweet potatoes of practically no market value were found to be worth 34 cts. per bushel when compared with corn at $1 per bushel and fish meal at $60 per ton. Their feeding value was somewhat reduced (25 cts. per bushel) when fed with a 2 per cent corn ration. In the second test the pigs were allowed to harvest the crop and received in addition fish meal and minerals in self-feeders. The yields of potatoes were low, but 360 lbs. of pork were produced per acre and the pigs killed hard.

In continuing the soft pork studies in cooperation with the Bureau of Animal Industry, U. S. D. A. (E. S. R., 49, p. 775), one lot of 12 75- to 100-lb.

pigs was fed on soy beans plus a 2.5 per cent ration of shelled corn for 8 weeks, followed by 12 weeks finishing on corn and tankage. A similar lot was self-fed in dry lot on peanuts for 8 weeks and finished for 12 weeks on corn and tankage. The soy bean lot made average daily gains of 1.17 lbs. during the grazing period and 2.01 lbs. in the finishing period. The peanut lot made average daily gains of 1.38 and 1.65 lbs., respectively, in the two periods. Neither lot killed strictly hard.

[Experiments with swine at the North Dakota Station], J. H. SHEPPERD, F. W. CHRISTENSEN, O. A. THOMPSON, and A. C. KUENNING (*North Dakota Sta. Bul. 174 (1924), pp. 20, 21, 22, 26, 78, 79, 95, 96, fig. 1*).—Investigational work with swine included the following experiments:

Pasturing crops with pigs.—Experimental results in fattening hogs have demonstrated the economy of forage crops as compared with dry lot feeding. The order of preference of the different crops used, based on the gains made, is as follows: Alfalfa, peas and oats, rape, sweet clover, brome grass, winter rye, oats and barley, and millet. Grain fed at the rate of 3.5 lbs. per 100 lbs. live weight has been the most satisfactory. In an average season it has been found that 30 March pigs may be carried per acre of alfalfa pasture.

"*Hogging off*" *corn.*—Nine years' results of this experiment (E. S. R., 48, p. 72) indicate that pigs weighing from 100 to 125 lbs. make the best use of corn in hogging off tests and that the corn should be in the glazing stage when pigs are turned into it. In determining the carrying capacity of corn, it is suggested that 5 lbs. of corn grain, as estimated, be calculated as the consumption per 100 lbs. of live weight per pig daily. In testing the desirability of furnishing tankage as a supplement to corn for hogging off, it was found that better gains and thriftier pigs resulted when tankage was fed, but with recent prices it was not a profitable venture. Pigs changed from rations of corn to a ration of barley in the late season do not do as well as when they are finished on corn.

Shrinkages in shipping live stock.—Shrinkage in swine has been found to be at a minimum for animals taken from hogging off corn lots as compared with others handled in a manner in which they received less exercise.

Sprouted vs. unsprouted barley for pigs.—In a 90-day experiment dealing with the nutritive deficiencies of barley, one pair of pigs received a ration of barley alone, while two other pairs received sprouted or unsprouted barley plus linseed meal and middlings. Bone meal and salt were given to all lots. The pigs in the lot receiving barley alone made the poorest gains, but the sprouted barley (sprouts ¼ to ¾ in. long) showed no superiority over unsprouted barley.

"*Hogging off*" *experiments [at the Edgeley Substation].*—In another year's comparative test of corn and peas for hogging off, the gains made were much as in 1921 (E. S. R., 48, p. 72). The estimated returns per acre were, however, greater for the peas than for the corn.

Hogs [at the Williston Substation].—Four sows weighing a total of 1,200 lbs., while on sweet clover pasture consumed 2,100 lbs. of ground barley in 30 days, making a gain in weight of 380 lbs.

Hairlessness in pigs [at the Williston Substation].—Four purebred Duroc-Jersey sows, though receiving 6.5 grains of iodin per day for 18 days prior to parturition, farrowed 31 hairless pigs. A grade sow which had received the iodin 2 weeks longer farrowed 7 haired pigs.

Soybeans in corn for hogging-down, W. L. ROBISON (*Ohio Sta. Mo. Bul., 9 (1924), No. 5-6, pp. 75-80*).—The average results of three years' experiments in hogging down corn with supplements are given in the following table:

Summary of three years' experiments in hogging down corn and soy beans of rape.

Ration.	Average initial weight of pigs.	Average daily gain.	Gain per bushel of corn.	Tankage per bushel of corn.	Calculated returns per acre minus cost of tankage.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	
Standing corn containing soy beans	147.4	1.08	8.89	....	$32.74
Standing corn containing soy beans plus tankage	147.6	1.73	13.23	2.29	45.14
Standing corn plus tankage	146.9	1.78	12.62	2.83	45.75
Standing corn containing rape plus tankage	147.3	1.88	12.89	2.06	47.75

The results of similar experiments and others dealing with the effect of soy beans and rape on the yield of corn per acre, conducted at several State experiment stations, are discussed. The conclusions indicate that pigs on standing corn containing soy beans gain more rapidly and produce larger gains per bushel of corn than on corn alone, but, due to the reduction in the yield of the corn by the soy beans, it is questionable which method results in the greatest gains per acre, whether tankage is or is not fed.

[Poultry investigations at the Idaho Station] (*Idaho Sta. Bul. 133* (*1924*), *pp. 13, 14*).—One pen of Single Comb White Leghorn pullets receiving pea meal and sour milk as protein supplements averaged 181.2 eggs per bird for the year. In three years' experiments sour skim milk has proved to be a valuable and economic source of protein for laying hens. Other experiments have shown that lactic acid and milk salts are not the factors in sour skim milk which stimulate egg production.

In a test of the effect of accessory food factors on egg production and health, one lot of birds developed a disease resembling roup in March, and 13 later died from the disease. The birds of the other lot retained their health and vigor though receiving a similar ration except that 1 oz. of cod liver oil was administered daily.

The value of certain protein feeds for production and quality in eggs, R. T. PARKHURST (*Idaho Sta. Bul. 134* (*1924*), *pp. 8, figs. 3*).—More detailed results are given of the three years' experiments previously noted (E. S. R., 49, p. 777) and noted above. The importance of including in the rations of laying hens protein supplements of animal or animal and vegetable origin was demonstrated. The ration containing pea meal and sour skim milk produced the most eggs at the lowest cost per dozen.

[Poultry experiments at the Indiana Station] (*Indiana Sta. Rpt. 1923*, *pp. 39–42*, *figs. 2*).—The experimental work of the department of poultry husbandry is briefly summarized, part of this being in continuation of experiments noted in the previous report (E. S. R., 49, p. 573).

Soy bean oil meal can replace tankage.—The results of a second year's comparative test of tankage v. soy bean oil meal and minerals as supplements to a basal ration for laying hens indicate that soy bean oil meal can replace tankage partly or entirely, provided minerals are supplied. Six lots of 30 Barred Plymouth Rock pullets each were used in the experiment. The protein supplements and the average production for the different lots were as follows: Tankage 138.5 eggs, tankage and soy bean meal (2:1) 134.2 eggs, tankage and soy bean meal (1:1) 123.1 eggs, tankage and soy bean meal (1:2) 105.9 eggs, soy bean meal 124.9 eggs, and soy bean meal without minerals 88.7 eggs.

Chicks need vitamins.—In an experiment with 12 lots of 20 chicks each, the necessity of supplying feeds containing vitamins was demonstrated. The mortality of the chicks was high in all lots except two which received dried buttermilk with and without green alfalfa. Neither green alfalfa nor sprouted oat tops gave satisfactory results alone, but when fed together they were of more value.

Corn germs rich in vitamin B.—The essential nutritional factor contained in corn germ, as noted in a previous report, was found in a series of tests to be water-soluble B.

Do vitamins influence hatchability?—In making this study, 5 lots of hens were fed on rations of corn, wheat, and oats, with the additional sources of vitamins as follows: Tankage, fish scrap, and meat scraps; buttermilk; canned tomatoes; and hog liver. The percentages of hatchability of the fertile eggs in the 4 lots were 52.1, 60.5, 69.6, and 57 per cent respectively. In a lot receiving no additional supplements the hatchability was 50 per cent.

Feeding experiments [with poultry], B. F. Kaupp and R. S Dearstyne (*North Carolina Sta. Rpt. 1923, pp. 67, 68*).—The results of the studies conducted indicate that dried buttermilk is practically as suitable a feed for poultry as either liquid buttermilk or condensed buttermilk. Other experiments have indicated that fish meal may be used to replace meat meal for egg production, fattening, or rearing, and no fishy flavor was imparted to the eggs or the flesh of the fattened fowls when given in quantities up to 20 per cent.

A statistical study of egg production in four breeds of the domestic fowl, I, II, L. C. Dunn (*Connecticut Storrs Sta. Buls. 117 (1924), pp. 23–88, figs. 8; 118, pp. 96–140, figs. 6*).—The monthly and annual egg production of the Wyandotte, Rhode Island Red, Plymouth Rock, and Leghorn pullets entered in the nine international egg-laying contests conducted at the State agricultural college and experiment station from 1911 to 1920 has been treated statistically for each breed and the usual biometric constants determined. The first two parts of this series deal with Wyandottes and Rhode Island Reds.

Part I. *Egg production in Wyandottes.*—This study is based on the annual individual egg records of a total of 903 pullets. The existence of considerable variability in the egg records of Wyandottes averaging 28 per cent for the nine years was demonstrated. The annual production of individuals varied from 0 to 308 eggs, averaging 159.3±1.01. During the nine years of the tests there was a gradual increase in annual productinon of about 7 eggs, and the percentage of the annual production occurring in the winter months was increased about 8 per cent. The percentage of birds laying over 210 eggs was also somewhat increased during the period. The data are tabulated in detail according to monthly and annual production.

Part II. *Egg production of Rhode Island Reds.*—This study is based on the annual egg records of 1,132 Rhode Island Red pullets. As in the Wyandottes, the coefficient of variability for annual production averaged 28 per cent, the range for individuals being from 0 to 270 eggs, averaging 153.58 ±0.88. The average egg production has shown a tendency to increase during the nine years of the test by about 1 egg per year. The proportion of high producers has also shown a tendency to increase during the test, while the proportion of low producers has remained stationary. The detailed data are presented as in the previous study.

Observations on European poultry farming, W. C. Thompson (*New Jersey Stas., Hints to Poultrymen, 12 (1924), No. 11, pp. 4, fig. 1*).—Very brief reviews of poultry farming in Spain and England are given.

DAIRY FARMING—DAIRYING.

Effect of high and low protein content on the digestibility and metabolism of dairy rations, A. E. Perkins and C. F. Monroe (*Ohio Sta. Bul. 376 (1924), pp. 85–116, figs. 4*).—The results of a study of the effect of high or low protein rations fed over a long period on their digestibility and the nitrogen, calcium, phosphorus, magnesium, and sulphur balances of dairy cattle are reported.

In the first trial of this experiment, 2 cows were fed a ration having a nutritive ratio of 1:9, while 2 other similar cows received a ration having a nutritive ratio of 1:4. In the second trial, 1 of the animals previously receiving the wide ration and 1 previously receiving the narrow ration were given rations having nutritive ratios of 1:2 and 1:11, respectively. The cows had always received either wide or narrow rations as was furnished to them in the first trial, and the dams of these cows had likewise received rations of the same type. The data on the digestibility of the rations, water consumption, weights of the animals, composition of feeds, feces, urine, and milk, and nitrogen, calcium, phosphorus, magnesium, and sulphur balances, as well as other related information, are tabulated in detail in the appendix and discussed in the text.

The general results indicate that the digestibility of the rations was lower than that estimated according to calculations of the average digestibility of the feeds used, based on Henry and Morrison's standards. The divergence from the calculated digestibility was greater with the low protein than with the high protein rations, though the differences were not great. A greater water consumption accompanied the high protein rations, as well as a much greater elimination of water in the brine. The cows on the wide ration maintained a positive nitrogen balance with one exception, and the live weight was maintained or slightly increased.

In regard to the mineral balances, it was found that the cows on the high protein rations stored calcium, while those on the low protein rations were in negative calcium balances. A possible cause for this difference is the greater amounts of clover hay which were consumed in the high protein ration. The phosphorus balances in the first experiment were similar for the two groups, but the narrow ration aided in production of a greater phosphorus retention in the second experiment. No marked differences between the magnesium, sulphur, and nitrogen balances of the cows fed on the two types of rations were evident. One of the main features of the results was that the calcium and phosphorus balances obtained were much more favorable than had been reported by other workers for dairy cattle during lactation.

[Dairy cattle feeding experiments at the Indiana Station] (*Indiana Sta. Rpt. 1923, pp. 22, 23, 25*).—One series of trials has indicated that soy bean oil meal plus minerals is a more efficient source of protein for milk production than either cottonseed or linseed meal. In a second trial soy bean oil meal and linseed oil meal were found to be equal. Feeding ground soy beans increased milk and fat production about 3 per cent as compared with linseed meal.

In a study of methods and rations for wintering dairy heifers, 3 lots wintered in the dairy barn made average daily gains of 1.25 lbs. as compared with 0.86 lb. by heifers wintered in an open shed. Heifers receiving soy bean oil meal without mineral supplements made the greatest gains. In a comparative test of silages, a mixture of equal parts of corn and sunflower silage gave better results for milk and fat production than either silage alone.

The experimental feeding of 4 lots of calves indicated that calves may be successfully placed on a ration of grain and hay at 60 days of age. When skim milk was fed to 6 months of age the calves were heavier, however. No change in the growth occurred with the substitution of soy bean oil meal for linseed oil meal.

The feeding value of cotton seed meal and hulls for dairy cows, (*North Carolina Sta. Rpt. 1923, pp. 14, 59*).—In continuation of this experiment (E. S. R., 49, p. 780), in cooperation with S. Combs and R. S. Curtis, no spasms or convulsions have occurred in the 10 cows and 5 heifers used and 2 normal calves were born. These conditions are attributed to the inclusion of 10 supplements in the rations of cottonseed meal and hulls. The 2 living calves were produced when supplements of alfalfa meal and oats were included.

In experiments at the Coastal Plain Substation cottonseed meal and peanut meal have proved of equal value for growing heifers when mixed with equal parts of crushed corn, oats, and wheat bran. Tests of home mixed feeds and ready mixed feeds for milk production have indicated that the home mixed feeds are more palatable, produce more milk, and are more economical.

[Silage v. no silage for milk production] (*Nebraska Sta. Rpt. [1923], p. 34*).—Rations containing grain, alfalfa hay, and corn silage were compared, at the North Platte Substation, with rations containing corn and alfalfa hay plus as much corn as was included in the silage of the other ration, for milk production with 2 lots of cows during 5 20-day periods, with 10-day transition periods between each. While on the silage rations the cows gained 30 lbs. in weight and produced 1,444 lbs. of milk containing 50.14 lbs. of butterfat. On the ration containing no silage, the cows lost 12.6 lbs. in weight and produced 1,474.5 lbs. of milk containing 53.15 lbs. of butterfat.

[Sweet clover silage for milk production], J. R. Dice (*North Dakota Sta. Bul. 174 (1924), pp. 44, 45*).—Sweet clover silage made by stacking green sweet clover was found to be from 85 to 90 per cent as efficient for milk production as corn silage in 20-day tests, using 5 cows and 5 heifers. The difference in the value of the two types of silage was largely due to a wastage of about 10 per cent of the coarser stems of the sweet clover.

A study of the birth weight and gestation of dairy animals, J. B. Fitch, P. C. McGilliard, and G. M. Drumm (*Jour. Dairy Sci., 7 (1924), No. 3, pp. 222–233*).—The results of a study of the birth weights and gestation periods of 521 calves born in the dairy herd at the Kansas Agricultural College from September 1, 1910, to January 1, 1922, are given. The birth weights of the dams were also recorded. All calves from gestations of less than 260 or more than 295 days were omitted. The following table gives a summary of the average birth weights, gestation periods, and relative weights of calves and dams for the purebreds of the four major dairy breeds, the grade Holstein herd, and the experimental Holstein herd:

Average birth weights and gestation periods of the four major dairy breeds.

Breed.	Average weight of calves.				Length of gestation.		
	Bulls.	Heifers.	Both sexes.	Per cent of dams' weight.	Bull calves.	Heifer calves.	Both sexes.
	Pounds.	*Pounds.*	*Pounds.*	*Per ct.*	*Days.*	*Days.*	*Days.*
Jersey	59±1.17	54±1.30	57±0.90	6.3	285.9±0.95	282.0±1.03	284.3±0.72
Guernsey	67±1.18	60±1.17	64± .90	6.7	283.5± .60	282.5± .54	283.0± .46
Ayrshire	75±1.35	69±1.44	72±1.03	6.9	284.6± .71	284.6± .55	284.6± .44
Holstein	101±2.12	90±1.96	95±1.57	7.1	282.8± .79	281.8± .95	282.2± .62
Grade Holstein	91±1.80	87±2.09	89±1.37	7.7	281.2± .86	280.8± .89	281.0± .68
Experimental Holstein	96±2.15	85±1.52	90±1.43	8.6	280.6± .76	280.2±1.12	280.4± .69

In studying the effect of various factors on the weights of calves at birth, it was observed that the nutrition of the dam had little or no influence except when restricted rations were fed over a long period. Some bulls seemed to have an influence on the weight of the calves, but significant differences between the average weights of the calves of the different bulls used were not found. The number of the birth, as studied from the records of cows having five or more calves, indicated that the weight of the calf increased up to the fifth birth of the dam and decreased after the sixth The length of the gestation period also seemed to effect the weight within breeds, as lighter calves had shorter average gestation periods, but Jerseys did not have shorter periods than Holsteins. Marked individual differences in the length of the gestation periods of the cows having more than five calves were also evident.

A study of the weight of dairy cattle (*Nebraska Sta. Rpt.* [*1923*], *p. 10*).—The average weights of the males and females of the Holstein and Jersey breeds and the females of the Guernsey and Ayrshire breeds in the university herd are reported at birth, 3 months, 6 months, 9 months, and 1 year of age.

The influence of the stage of lactation on the production of dairy cows, A. C. McCandlish (*Jour. Dairy Sci.*, *7* (*1924*), *No. 3*, *pp. 255–261*, *fig. 1*).—In studying the influence of the stage of lactation on production, 428 lactation records of 162 cows, made in the Iowa State herd from 1907 to 1921, were tabulated according to the breed, A general decrease in the milk and fat production with advancing lactation was observed in all breeds, though the Holstein and Ayrshires reached their highest milk production in the second month. The fat percentage of the milk of Ayrshires and Holsteins was found to drop to the third month, but this was soon followed by a gradual rise to the end of lactation. The fat percentage of Guernsey milk dropped in the second month and gradually increased from then on, whereas Jersey milk showed a gradual rise in fat percentage from the beginning to the end of lactation. It is pointed out that high initial production is not the only consideration for choosing high annual producers, but that continuance of production is very important.

[Experiments in dairy bacteriology at the Indiana Station] (*Indiana Sta. Rpt. 1923*, *pp. 23*, *24*, *25*).—The results of two studies in dairy bacteriology are briefly reported.

A chemical and physiological study of the action of specific organisms and of a group of organisms found in sweet and sour cream butter and in synthetic butter.—In studying the proteolytic action of 10 different organisms in butter, samples of synthetic butter were inoculated with the organisms and held at room temperature and in cold storage. The action of these organisms in milk was also observed. The organisms used, *Bacillus panis migula*, *B. micrococcus viscosus*, *B. proteus vulgaris*, *B. butyricus*, *B. megatherium*, *B. coli*, *B. mesentericus*, *B. acidi lactis*, *B. liquefaciens*, and *B. mycoides*, all produced considerable action on the milk proteins in the synthetic butter. The proteolytic action seemed to bear a close relation to the ammonia production, the action usually being as great when held for 60 days at room temperature as when held for 120 days in cold storage. Salt was found to have no action on the keeping quality of butter.

Germ content of the creamery churn.—In this study four methods of cleaning the churn were compared, the greatest advantage being shown when hot water, cleansing powder, and a hypochlorite solution were used.

Practical introduction to the manufacture and handling of Emmental cheese, A. Peter, J. Held, and H. Arm (*Praktische Anleitung zur Fabrikation und Behandlung des Emmentalerkäses. Bern: K. J. Wyss Erben, 1922*, *4. ed.*, *rev.*, *pp. VII+115*, *pls. 12*, *figs. 2*).—The book previously noted (E. S. R., 28, p. 475) has been revised and rewritten.

The principles of ice-cream making (*Nebraska Sta. Rpt. [1923], pp. 10–12*).—The continuation of this study (E. S. R., 49, p. 782) has consisted of experiments on the effect of acidity and aging on the yield, quality, and flavor of ice cream. It was found that increases in the acidity of the mix by the use of starters did not improve the physical properties and did produce objectionable flavor. The optimum aging period has been found to be between 24 and 48 hours, excessive aging causing a decrease in the viscosity and undesirable changes in the physical properties.

VETERINARY MEDICINE.

[Report of the Indiana Station] department of veterinary medicine (*Indiana Sta. Rpt. 1923, pp. 59–64, figs. 2*).—The death rate occurring in early spring litters of pigs is said to be greater than in litters farrowed in late spring, part of which loss is attributed to conditions such as chilling, to which the early litters are subjected. The early litters, however, do not seem to suffer more than late ones from infectious diseases and infestation with lung and intestinal parasites. Pig typhoid has been found to occur more often in late winter and early spring pigs and frequently causes heavy loss. Healthy pigs kept for several months in contact with sick animals have continued healthy. The condition of the sick animals is said to suggest food deficiencies as one of the causes of pig typhoid. Swine dysentery was observed in nine herds, eight of the outbreaks being sufficiently virulent to produce typical symptoms of the disease in animals fed the colon contents and given direct exposure.

Healthy pigs kept for a period of 50 days in a pen 16 ft. from a pen constantly containing pigs infected with hog cholera failed to become infected. Healthy pigs placed in the cholera pen 1 and 2 days after the carcass of the last pig had been removed remained well at the end of 15 and 21 days, respectively. Six inclosed concrete pens were heavily bedded with straw over which cholera blood was sprinkled from 1 to 6 days before turning in the pigs. Cholera broke out among the pigs in the 1-day pen, one dying on the sixteenth day and the last on the twenty-seventh day, while lots in the other pens were well after 14 days, when all were inoculated with cholera blood and their susceptibility proved. In a repetition of this experiment, all the pigs in pens sprinkled with blood 1, 2, and 3 days before occupancy sickened after 6 and 10 days and died of the disease. In another experiment, cholera blood of known virulence, which had been spread over glass plates in a thin layer and kept in a well-lighted room 1, 5, 6, 7, 8, and 9 days, was injected subcutaneously and fed to 12 groups of pigs. The 1-day blood produced cholera in pigs fed and inoculated with it; the 5-day blood failed to produce cholera in the pigs that received it with their feed, but proved virulent when inoculated subcutaneously, producing symptoms in 4 days and death on the twelfth to twentieth days; the 6- and 7-day blood produced cholera in pigs fed and inoculated with it; but the 8- and 9-day blood was nonvirulent. All pigs that remained well were proved susceptible by inoculation with cholera blood. Pigs fed urine collected from the bladder of a cholera hog killed 10 days after inoculation with cholera blood sickened on the sixth day. Pigs fed feces collected from the rectum of the same carcass remained well. In infectious abortion studies, 98 samples of blood were taken from 20 herds of brood sows, 37 reacting to the agglutination test, showing the disease to be present.

In white snakeroot investigations, two horses were each fed daily 1 lb. of blossoms and leaves which had been dried for a period of three months, with the result that both animals showed slight inappetence on the fifth day of the experiment. One died on the eleventh day, and the other was killed on the fourteenth day, after being down in the stall and unable to rise. Four pigs averaging 60 lbs. were fed 30 lbs. of fresh tops, leaves, and stems of white snakeroot, and at the end of 15 days' feeding none showed any ill effect.

Of 44 herds of cattle having infectious abortion, which were under observation during the year, a number ceased to abort, and there was a marked decrease in the number of abortions in all but a few, with a corresponding increase in the number of calves raised. Of the 922 cows in the herds visited, 279 had aborted the previous year and were not pregnant early in the year or aborted during the year. Of blood samples collected from the aborting animals, 209 gave positive and 70 negative reactions. Of nonaborting animals, 74 or 11.5 per cent gave positive reactions. The agglutination test only was used. In 7 herds containing 234 animals, 97 gave positive reactions, 8 reacted throughout the year, 17 nonreactors aborted, and 48 gave birth to live calves. Abortion vaccination is briefly reported upon.

A peculiar hemorrhagic disease was observed in 2 herds of cattle, with a loss of 6 and 8 animals, respectively. Microscopic examination of stained smears of the contents of the hemorrhages did not reveal any microorganisms, and culture media seeded with contents of the hemorrhages in muscles of dead animals and with spleen pulp remained sterile.

In work with diseases of poultry, 15.6 per cent of 19,370 hens tested for bacillary white diarrhea reacted. Microscopic studies of the bones of chicks affected with leg weakness showed that the pathologic changes were the same as occur in rickets in other animals. Affected chicks recovered when given cod liver oil in feed.

Tests of hog cholera serum and virus are briefly referred to, as is the production of cholera serum and examination of pathological specimens.

Animal pathology [at the Louisiana State Station], H. Morris (*Louisiana Stas. Rpt. 1923, pp. 20, 21*).—In investigations of insects as disseminators of anthrax, practically the same results were obtained as in the previous year (E. S. R., 49, p. 881). Fifty per cent of infections were produced by *Tabanus fulvulus* Wd., while other species gave lower percentages of infection. Reference is made to infectious abortion work, which has proved that it is possible to keep the disease under control while working under adverse conditions.

Animal diseases [studied at the Nebraska Station] (*Nebraska Sta. Rpt. [1923], pp. 8–10*).—Brief reference is made to investigations being conducted with organisms of the hemorrhagic septicemia group, their characteristics and development. A highly potent immune serum for use against the fowl cholera organism was produced, although the immunity offered by this serum was of short duration and it was not possible to lengthen or to activate this immunity by the introduction of virus during the immune period of the test animals.

Reference is made to work with poultry diseases in the State, an account of which, by Van Es and Martin, has been noted (E. S. R., 50, p. 185).

Investigations of the relation of avian tuberculosis to that of swine, under way, are briefly referred to. Through cooperation with the U. S. D. A. Bureau of Animal Industry, it was possible to secure a complete survey of the animals on 14 of the farms from which the tuberculous swine originated. On all of these farms the poultry flocks were found to be infected with tuberculosis, but on only one were the cattle also found to suffer from this infection. On 10 of the farms swine were also tested, and on 5 those animals were found to be tuberculous. It is considered significant that many of those swine tested simultaneously with mammalian and avian tuberculin reacted only to the latter. Twenty-six consignments of tuberculous swine from South

Omaha and Nebraska City packing establishments all failed to show bacilli of mammalian origin, but in 21 of the specimens the disease was found definitely to have been caused by the avian strain.

The preparation and sending of specimens for laboratory diagnosis, F. R. BEAUDETTE (*New Jersey Stas., Hints to Poultrymen, 12 (1924), No. 10, pp. 4, fig. 1*).—The value of laboratory examination in the diagnosis of diseases of the fowl is emphasized, and directions are given for the preparation and sending of materials.

Relation between toxicity of cottonseed and its gossypol content, E. W. SCHWARTZE and C. L. ALSBERG (*Jour. Agr. Research* [*U. S.*], *28* (*1924*), *No. 2, pp. 173–189, figs. 13*).—This is a report on the results of investigations conducted by the U. S. D. A. Bureau of Chemistry, in which a comparison was made of the toxicity of pure gossypol with that of four varieties of cottonseed kernels, rats being used as the experimental animals. Pure gossypol in peanut oil and the ether extract of cottonseed kernels were injected intraperitoneally into some of the rats. In feeding tests rats received an adequate diet to which were added in some cases known quantities of gossypol and in other cases raw cottonseed kernels in which the gossypol content had been determined. Four varieties of cottonseed were tested in the experiments, namely, Trice, Lone Star, Durango, and Egyptian.

Administered intraperitoneally, the lethal dose of gossypol was found to vary from 20 to 50 mg. per kilogram of live weight. The results demonstrated that Durango and Egyptian seeds, which contained the larger quantities of gossypol, were as toxic as predicted on the basis of chemical analysis, whereas seeds of the Lone Star and Trice varieties, which contained less gossypol, were less toxic than predicted. In the experiments there was no significant difference in the rate of growth of rats fed the peanut meal diet and those fed the ether-extracted cottonseed kernel diet. When 0.225 per cent of gossypol was added to an adequate diet the rats ceased to grow and all died within 3 days. The feeding experiments with diets containing either added pure gossypol or raw cottonseed kernels added to the diet in such proportion that the gossypol content of the total diet was known show the same parallelism between gossypol content and toxicity.

"The symptoms observed from feeding gossypol and cottonseed kernels were similar. They consisted of loss of appetite and depression of growth, which, if sufficient quantities of gossypol or of cottonseed kernel had been fed, often led to death if the feeding was continued. If the feeding was discontinued and the animals changed to control diet, growth was resumed at varying rates. There was some evidence that animals were permanently injured when fed for long periods on the gossypol or raw cottonseed kernel diets." The authors consider these results to bear out the conclusion that the toxicity of cottonseed kernels is due to their gossypol content.

A list is given of 10 references to the literature cited.

Pharmacology of gossypol, E. W. SCHWARTZE and C. L. ALSBERG (*Jour. Agr. Research* [*U. S.*], *28* (*1924*), *No. 2, pp. 191–198, pls. 2*).—In experiments, conducted by the U. S. D. A. Bureau of Chemistry, gossypol was fed for long periods to cats and rabbits in dosages small enough to avoid marked loss of appetite yet large enough to produce chronic intoxication. The symptoms and lesions observed included loss of appetite with the larger dosages, paralysis, with nerve degeneration, shortness of breath, cardiac hypertrophy, edema of the anogenital region and of the lungs, and effusion into the serous cavities. It was found that spontaneous recovery may occur temporarily while gossypol is being administered, and the condition of the animal may become progressively worse for some time after it is discontinued. Subcutaneous, intravenous, and intraperitoneal injection of gossypol results in a local edema of the lungs, which may be hemorrhagic, and effusion into the serous cavities. Blood pressure falls, heart action becomes irregular, and death comes from cardiac involvements. The conclusion that gossypol is the principal causative agent of cottonseed poisoning, reached in the paper above noted, is reaffirmed.

A list is given of 11 references to the literature cited.

Fatal hemorrhage, evidently resulting from feeding damaged sweet clover hay and silage, A. F. Schalk (*North Dakota Sta. Bul. 174 (1924), pp. 71–74, figs. 2*).—This is a brief account of investigations conducted following the extensive occurrence of a fatal hemorrhagic condition in cattle during the fall and winter of 1922–23. It is stated that approximately 100 farms in 12 different counties reported this disease in cattle, mainly in animals less than three years of age, although older cattle were occasionally affected. Upon every farm experiencing this condition, sweet clover hay or silage of a questionable nature was a part or all the food used. The problem is said to be a very comprehensive one, which may require considerable time and extensive investigations. Recent accounts of this disease in Ontario by Schofield have been noted (E. S. R., 50, p. 878; 51, p. 383).

Studies of plants poisonous to cattle, R. Menéndez Ramos (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1923, p. 22; also in Spanish ed., p. 23*).—Feeding experiments with tibey (*Isotoma longiflora*) have failed to demonstrate any poisonous effect. Extracts from all parts of the plant, taken at different times of day and different seasons of the year, failed to produce poisonous effects in guinea pigs, sheep, goats, and horses.

Hog cholera and possible complicating diseases, I–VIII, A. F. Schalk (*North Dakota Sta. Bul. 174 (1924), pp. 63–68*).—Miscellaneous studies are reported as follows:

I. *Hemorrhagic septicemia experiments—feeding and injecting of and pen exposure to the bipolaris suisepticus organisms.*—Attempts were made to lower the vitality of hogs in various ways and then to feed them large quantities of suisepticus bacilli to determine whether susceptibility to such infection is enhanced by unfavorable conditions resulting in decreased resistance. Insanitary conditions, starvation and unbalanced rations, and wounds were all tested, but in none of the experiments did any of the pigs show signs of infection. The intravenous and intracardial injections of from 5 to 10 cc. of the virulent cultures were likewise without effect.

II. *The occurrence and isolation of bipolaris suisepticus in hogs with cholera.*—Samples of the heart and lung blood of 12 cholera-infected pigs were tested for the presence of suisepticus bacilli by intravenous inoculation into rabbits. In 3 cases the presence of these organisms was demonstrated in both heart and lungs, in 3 in the lungs but not the heart, while in 6 there was no evidence of infection. The lungs in which the organisms were identified were in half of the cases normal and in the other half congested.

III. *Bipolaris septicus types of bacteria.*—Complement fixation tests have shown that the bacterial strains causing hemorrhagic septicemia in cattle and hogs are of the same type and differ from those causing the disease in sheep, fowls, rabbits, and guinea pigs.

IV. *Necrotic enteritis experiments.*—The feeding of young pigs with the tissues of pigs suffering from necrotic enteritis, and the subcutaneous or intramuscular injection of the blood of infected pigs, did not result in the development of either hog cholera or necrotic enteritis. Negative results were obtained in agglutination tests of the blood sera of pigs affected with necrotic enteritis with *Bacillus coli*, *B. typhosus*, *B. cholera suis*, *B. enteritidis*, and *B. paratyphosus A* and *B*.

V. *Attenuation experiments on hog cholera virus.*—Attempts to attenuate hog cholera virus by mixing with tuberculin and by subjecting the virus to an electric current of low power gave negative results. At higher amperage for 24 hours some samples of virus were completely inactivated, but possessed no antigenic or immunizing properties.

VI. *Virus precipitation experiments.*—On complete precipitation of the proteins of hog cholera blood or serum virus the protein-free filtrate proved inactive and the precipitate to contain the active virus. In explanation of this it is suggested that the virus itself may be a protein which is precipitated or that it may be adsorbed by the serum protein.

VII. *Chemical analyses of the blood of swine.*—A series of samples of blood from normal hogs and two series from hogs in various stages of hog cholera were analyzed for sugar and for nitrogen distribution as total nitrogen, urea, uric acid, amino acid nitrogen, preformed creatinin, and total creatinin. One of the series of hog cholera blood showed no evidence of the retention of the urea fraction of the nonprotein nitrogen and the other distinct evidence of such retention as shown by the following figures: Urea nitrogen in 12 samples of normal blood 17.2 mg. per 100 cc., in 15 samples of hog cholera blood (first series) 16.4, and in 10 samples of hog cholera blood (second series) 34.5 mg. No marked differences were noted in the percentage composition of the remaining protein decomposition products nor in the blood sugar.

VIII. *Experiment to ascertain the longevity of hog cholera virus.*—The exposure of hog cholera virus to a current of oxygen for 24 hours had no appreciable effect in maintaining the potency of the virus.

Swamp fever or infectious anemia [and other studies], A. F. SCHALK (*North Dakota Sta. Bul. 174* (*1924*), *pp. 68–71*).—In experiments in which the swamp fever virus was precipitated by the Folin method, the virus was completely destroyed by the action of the chemicals involved in the precipitation. It is pointed out that the chemicals had no such inactivating or destructive effect on the hog cholera virus.

Reports by British authorities that the acridin compounds show unusual germicidal power upon certain organisms led to the systematic treatment of two swamp fever horses with proflavin. It was administered intravenously in 0.85 per cent salt solution, one horse receiving 5 gm. in all in 18 days and the other 10 gm. in 3 daily injections. Both animals continued to show periodic fever typical of swamp fever, and the blood from both horses produced the disease in susceptible animals, thus indicating that proflavin is of no curative value in this disease.

Considerable time was devoted during the year to the treatment of swamp fever with neoarsphenamin, an arsenical preparation simulating neosalvarsan and salvarsan. It was administered to nine horses intravenously, at a strength of 1 gm. to 100 cc. The dosage ranged from 1.5 to 12 gm. at each administration and was given in series consisting of from 2 to 7 treatments each. The individual treatments were usually 3, 5, or 7 days apart. All treated animals continued to show the characteristic febrile reactions, and the blood from all treated animals never failed to reproduce the disease when injected into susceptible horses, showing that with this disease neoarsphenamin has no curative effect nor attenuating properties.

It is reported that the 6-year-old gelding which was given the experimental swamp fever by an artificial inoculation of virulent blood from a swamp fever horse in September, 1908, has continued an infection carrier for 14 years. A study of this case shows that an artificially infected animal may survive for years without anemia and then, without any apparent exciting factor, rapidly break down and show all the phenomena of a typical field case, including a profound anemia. During all this period the virulence of the blood of this animal was fully maintained, as shown by not less than 18 positive inoculations.

Brief reference is made to Gastrophilus sensitization of young colts, in which it is pointed out that additional investigations during the year absolutely confirm the sensitization theory, by way of the mother's milk, with some evidence of sensitization as early as the seventh day after birth.

Preliminary investigations of so-called rat viruses have been noted in detail in Bulletin 155 (E. S. R., 47, p. 51).

Fowl typhoid, its dissemination and control, B. F. Kaupp and R. S. Dearstyne (*Jour. Agr. Research* [*U. S.*], *28* (*1924*), *No. 1*, *pp. 75–78*, *figs. 2*).—In this account the authors first deal with the morphology of the causative organism, *Bacterium sanguinarium* or *gallinarium* (*Eberthella sanguinaria* Moore), known on the Continent as Klein's bacillus, its cultural characteristics. artificial infection, etc. In studies of 38 cases of fowl typhoid artificially infected by mouth, by subcutaneous inoculation, or through the drinking water, a period of from four to six days was found to pass before definite clinical symptoms appear. The temperature in severe cases runs as high as 111.5° F., respiration going as low as 23. The organism was recovered from the blood current of infected birds in two instances, four and six days, respectively, after infection.

"Hematological studies show a reduction of erythrocytes; leucocytosis, with a decided increase in the polymorphonuclear leucocytes. There is a decided lack of coagulability of the blood. The polymorphonuclear leucocytes may run as high as 95 per cent while the lymphocytes go down to 5 per cent; the erythrocytes fall as low as 1,160,000; the face, comb, and wattles become anemic; hemoglobin may fall to 75 per cent."

The clinical symptoms and the gross and microscopic anatomy are briefly considered. It is pointed out that the causative organism may be recovered from the heart, liver, spleen, kidneys, lungs, ovaries or testicles according to sex, bone marrow, and the brain. Vaccination is said to be the most practical method of treating the disease, using autogenous vaccines when possible and stock vaccines if necessary. A vaccine consisting of 24-hour bacillary saline emulsion, heated one hour at 60° C., tested for efficiency of desensitization by pig inoculation and cultures and preserved with 0.5 per cent phenol, was administered in doses of 1 cc. for adults and 0.5 cc. for chicks weighing from 1 to 2 lbs. In 19 epidemics, 2,140 birds were vaccinated, and the subsequent loss was reduced to 41, against a loss of 303 in the flocks prior to its administration. Among 974 birds prophylactically vaccinated during the year on infected premises, no losses occurred from this disease.

The examination of eggs from infected and immunized hens, with germicidal tests on albumen and blood serum, H. G. May (*Rhode Island Sta. Bul. 197* (*1924*), *pp. 5–48*).—Following the investigation of bacterial infection in fresh eggs reported in Bulletin 164 (E. S. R., 35, p. 174), an attempt was made to throw more light on the possible transmission of pathogenic organisms through the egg by a bacteriological study of the eggs of a series of fowls before and after repeated inoculation with different bacteria. In no case was there evidence of transmission of the inoculated bacteria through the egg or of localization of the organism in the ovaries of the hens, but various bacteria appeared to be present in larger amounts in the eggs after the inoculation than before.

A repetition of this work in another flock under more controlled conditions forms the subject matter of the first part of this report. In this experiment 36 hens were used, 18 of which served as controls, while the other 18 were inoculated after from 6 to 12 of their eggs had been examined for bacterial infection, and the eggs were examined from time to time throughout the spring laying season. Three groups of organisms were used, including three cultures of *Bacterium pullorum*, two of *B. gallinarum*, and four of *Pasteurella aviseptica* of known histories. One of the 2 hens treated with a given culture was fed from 2 to 4 cc. of a 24-hour broth culture throughout the experiment, and the other was injected intraperitoneally with 2 cc. of a killed culture, followed 3 or 4 days later by 1 cc. of a living 24-hour broth culture, the inoculation being repeated twice a week for from 6 to 8 weeks. In the case of the fowl cholera organism, two preliminary intraperitoneal inoculations of 1 and 2 cc., respectively, of a killed culture were given before the living cultures were used, the dosage of the latter being gradually increased from 0.5 to 2 cc.

With the exception of two of the four cultures of the fowl cholera organism, none of the bacteria had any effect upon the health of the inoculated fowls. All of the hens fed or injected with living cultures of typical *B. pullorum* showed infected ovaries, but there was apparently no transmission of the disease to the other inoculated fowls. None of the other organisms inoculated could be obtained from the ovary, heart, or liver of the inoculated birds.

The eggs were examined under sterile conditions by methods similar to those used by Hadley and Caldwell in the investigation noted above. With the perfection of methods of handling the eggs to prevent contamination, there was found to be no increase in egg infection due to inoculation or infection of the hen and no case of transmission of the organism.

Part 2 consists of the report of germicidal and agglutination tests conducted on egg albumin and blood serum. With the exception of the fowl cholera experiments, agglutinins were produced in all cases in the blood serum of the inoculated hens and to a lesser extent in the albumin of the eggs laid by these hens.

The germicidal power of the blood serum was extremely variable and seemed to depend to some extent on the culture used. In about half the flock there was no evidence of germicidal power, in some cases the serum was germicidal before inoculation and not afterwards, in others the reverse, and in some there was no change. The albumin from the eggs of normal hens showed only a slight inhibitory effect on the growth of bacteria when tested in 1 to 4 dilution, and with one exception there was no increase in the inhibitory effect during the immunization of the hens.

Parasitological studies, B. F. Kaupp and R. S. Dearstyne (*North Carolina Sta. Rpt. 1923, p. 69*).—The authors find that roundworms in the intestinal tract of the fowl can be successfully combated with nicotin, 2 per cent of powdered tobacco in dry mash being recommended. Routine autopsy work on dead fowls sent to the laboratory from various sources shows the gizzard worm (*Spiroptera hamulosa*), which burrows through the grinding part of the gizzard into the muscle walls, to be more prevalent than heretofore supposed.

RURAL ENGINEERING.

[Agricultural engineering studies at the Indiana Station] (*Indiana Sta. Rpt. 1923, pp. 44-46, figs. 3*).—Experiments with concrete fence posts are said to have shown that 4 lbs. of reinforcing is the least amount which will make a post strong enough for practical use.

Tests of the loss of power due to slipping of an open-rim wheel showed that when properly equipped with spade lugs this wheel had a slippage of less than 5 per cent as compared with 20 per cent for the regular wheel.

Annual report of the agricultural engineer, Burma, for the year ending 30th June, 1923, W. Smith-Rollo (*Burma Agr. Engin. Ann. Rpt., 1923, pp. [3]+6, pls. 2*).—The activities of this office are presented and discussed. These included primarily work with cultivating, pumping, and sugar machinery.

The mechanical properties of fluids (*New York: D. Van Nostrand Co., 1924, pp. XVI+362, pls. 10, figs. 143*).—This is a collection of essays on the subject. It contains chapters on Liquids and Gases, by A. Ferguson; Mathematical Theory of Fluid Motion, by H. Lamb; Viscosity and Lubrication, by A. G. M. Mitchell; Stream-line and Turbulent Flow, Hydrodynamical Resistance, and Phenomena Due to the Elasticity of a Fluid, by A. H. Gibson; The Determination of Stresses by Means of Soap Films, by G. I. Taylor; Wind Structure, by A. E. M. Geddes; Submarine Signaling and the Transmission of Sound through Water, by C. V. Drysdale; and The Reaction of the Air to Artillery Projectiles, by F. R. W. Hunt.

Ground water in Musselshell and Golden Valley Counties, Montana, A. J. Ellis and O. E. Meinzer (*U. S. Geol. Survey, Water-Supply Paper 518 (1924), pp. VI+92, pls. 5, figs. 11*).—This report, prepared in cooperation with the State engineer, the Montana State College, and the Montana State Board of Health, presents the results of a study of the ground water resources of the Musselshell and Golden Valley Counties in Montana, including data on physiography, rock formations and their water-bearing properties, and the quality of the water, special attention being paid to sources for farm use. The analytical data indicate that the waters of the area range in quality for irrigation from good to bad. Many of them are poor because of their large contents of sodium and sulphates, but still may be used successfully under favorable conditions.

Special articles on Storage of Rain Water in Cisterns, by K. Bryan; Tanks for Storing Stock Water, and Storage of Ice, both by G. M. Hall; and Purification of Surface Water by Chlorination, by W. M. Cobleigh, are included.

Additional ground-water supplies for the city of Enid, Oklahoma, B. C. Renick (*U. S. Geol. Survey, Water-Supply Paper 520-B (1924), pp. II+15-26, figs. 3*).—A brief statement is given of a ground water survey for the city of Enid, Okla., including chemical analyses of five samples of water.

Surface water supply of Hawaii, July 1, 1919, to June 30, 1920 (*U. S. Geol. Survey, Water-Supply Paper 516 (1924), pp. V+159*).—This report, prepared in cooperation with the Territory of Hawaii, contains the results of measurements of flow of certain streams and ditches in the Territory made during the year ended June 30, 1920.

Power resources of Snake River between Huntington, Oregon, and Lewiston, Idaho, W. G. Hoyt (*U. S. Geol. Survey, Water-Supply Paper 520-C (1924), pp. II+27-51*).—A brief summary is given of the power possibilities and related features of the area between Huntington, Oreg., and Lewiston, Idaho. It is stated that this text should be read in connection with river survey maps of the area.

The principles of irrigation engineering, with special reference to South Africa, F. E. Kanthack (*London and New York: Longmans, Green & Co., 1924, pp. 299, pls. 11, figs. 18*).—This publication is based on a course of lectures delivered by the author at the University of Cape Town. It deals with the principles of irrigation engineering, with special reference to requirements of irrigated agriculture in South Africa. It contains chapters on rainfall in the Union of South Africa; flow of rainfall from the ground or run-off; high floods, disposal of surplus water, and protection against floods; reservoir and canal losses; conservation of water; silt; duty of water and canal capacities; distribution of water on to the irrigable land; irrigation and brak; and irrigation law.

Peat as a protection against temperature changes and sound penetration and as a building material [trans. title], C. Birk (*Mitt. Ver. Förd. Moorkult. Deut. Reiche, 41 (1923), Nos. 13–14, pp. 131–133, figs. 3; 15–16, pp. 135–137, figs. 4; 17–18, pp. 143–145, figs. 3*).—Data on the insulating properties of peat against the penetration of heat and sound are presented, together with a discussion of the use of peat as a structural material, with particular reference to its insulating properties.

Sands and crushed rocks.—Volume I, Their nature, properties, and treatment. Volume II, Their uses in industry, A. B. Searle (*London: Henry Frowde and Hodder & Stoughton, 1923, vols. 1, pp. XIV+475, figs. 151; 2, pp. IX+281, figs. 12*).—This work consists of two volumes.

Volume 1 deals with the nature, properties, and treatment of sands and crushed rocks, with particular reference to their use as structural materials, and contains chapters on the origin and formation of sands; their occurence and distribution; the chief characteristics of various sands; mineral and other constituents; properties; examination and testing; prospecting, mining, and quarrying sand and sandrocks; crushing sandrocks and grinding sand; purification of sands and sandrocks; sizing or grading sands; and storage, packing, and despatching.

Volume 2 deals with the uses of sands and crushed rocks in industry. It contains chapters on the uses of sand in brickmaking, concrete, cements and mortars, plasters, road construction, metallurgy, as refractory materials, in agriculture, for filtration, in the chemical industry, in pottery manufacture, in glass making, as abrasives and polishes, and in explosives, as well as the miscellaneous uses of sand.

The bulking of moist sands: Effect of phenomenon on strength and yield of concrete, A. A. Levison (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 5, pp. 21–23, figs. 5*).—Experiments on the bulking of moist sands and its effect on the yield and strength of concrete are briefly reported.

The results showed that with gravel concrete the yield per unit volume of coarse aggregate exceeds that of trap rock by about 6 per cent. The decrease in yield due to the omission of coarse aggregate between 0.25 and 0.75 in. in size was from 3 to 4 per cent, while that due to using the nominal volume of damp sand without a correction for bulking was 7 per cent for a 1:2:4 mix and 8.5 per cent for a 1:2:3 mix. The decrease in yield due to using damp sand without a bulking correction and omitting the smaller sizes of coarse aggregate was 12 per cent.

A 1:2:4 mix made with dry sand averaged 14 per cent stronger than mixes made with the same volumes of damp sand. A 1:2:3 mix made with dry sand averaged 8 per cent weaker than mixes made with the same volumes of damp sand. The omission of the smaller sizes of coarse aggregate resulted in a decrease in strength of from 12 to 14 per cent. Cylinders of a 1:2:4 mix made with dry sand and well graded coarse aggregate averaged 17 per cent stronger than those made with damp sand and poorly graded coarse aggregate. With a 1:2:3 mix this difference in strength was 12 per cent in the same direction.

Grading aggregates by fineness modulus method, C. D. Willett (*Engin. News-Rec., 92 (1924), No. 24, pp. 1010, 1011, figs. 3*).—In a contribution from the California Highway Commission, charts are presented for the grading of aggregates for concrete by the fineness modulus method for three sizes of aggregate. These charts are said to enable the use of the Abrams theory of proportioning concrete when only standard sieves are available.

Friction tests of concrete on various sub-bases, A. T. GOLDBECK (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 5, pp. 19, 20, 23, fig. 1*).—Studies on the force of friction at the base of concrete roads are reported. Slabs 2 ft. wide, 6 ft. long, and 6 in. thick of 1:1.5:3 concrete were cast on 12 sub-bases, consisting of (1) clay with smooth top surface, (2) clay with cobblestones partly rolled in the surface, (3) broken stone, 0.75 in. to dust, flat top surface, (4) concrete base with top surface troweled smooth, (5) loam with smooth top surface, (6) sand with top surface smoothed and oiled with heavy flux oil, (7) clay with surface scored to make it uneven, (8) gravel, 0.75 in. to 0.25 in., flat surface, (9) broken stone, 3 in., (10) concrete base, troweled surface, oiled with heavy flux oil, (11) sand with smooth surface, and (12) clay oiled with heavy flux oil. Each specimen weighed approximately 870 lbs.

The results showed that movement took place almost as soon as the load was applied in all cases except that in which large broken stone was used in the base. In this case there was great friction from the start until a load of 1,000 lbs. was reached, when slipping occurred. Great force was required to start the slab, after which no more was necessary than in some of the other bases. Apparently the coefficient of friction is not constant but varies with the displacement. When the slab on the loam base had been slid 0.035 in., the load was gradually released and the return movement noted. The sub-base seemed to behave in a somewhat elastic manner, as the slab actually recovered considerable of its forward movement. Further results showed that much depends upon the moisture condition of the sub-base, a wet sub-base permitting the concrete to slide much more easily than a dry sub-base.

Tests of the effectiveness of a heavy oil coating for decreasing the friction at the sub-base showed that heavy flux oil was not effective in decreasing the friction in any of the bases, even when applied to the concrete base that had been carefully troweled smooth. The results showed in general that the coefficient of friction can readily vary from almost 0 to something over 2 or more, depending upon the movement of the concrete and the character of the sub-base.

Tractive resistance and related characteristics of roadway surfaces, T. R. AGG (*Iowa Engin. Expt. Sta. Bul. 67 (1924), pp. 62, figs. 33*).—Studies conducted by the Iowa Engineering Experiment Station in cooperation with the U. S. D. A. Bureau of Public Roads and the Iowa Highway Commission on the tractive resistance of road surfaces are reported.

The results showed that of the several groups of more or less independent resistance to the translation of a vehicle over a road the most significant to the highway engineer is that resulting from the interaction of the tire and roadway surface, including the impact effects on translation set up thereby. These effects, reduced to an equivalent force applied at the axle of the vehicle, constitute the rolling resistance, which is expressed in pounds per ton of weight of vehicle.

It was found impracticable to measure rolling resistance without including the resistance of still air to the passage of the vehicle. Rolling resistance varies within wide limits with the roughness, degree of rigidity, and physical texture of the roadway surface, the type of tire used, the temperature of the tire and of the roadway surface if of the bituminous type, and the gross weight carried by the tires. Within the range of good practice in the use of rubber tires, rolling resistance seemed to vary but little with the size of tire.

The temperature of tires was found to rise slowly when the vehicle is put in operation, but finally reaches a temperature at which the heat is dissipated as rapidly as it is generated. The maximum temperature reached will vary with the air temperature as well as with the use. This results in a seasonal variation in rolling resistance, which in the case of solid tires may reach a very material percentage of the total rolling resistance, but is less marked in the case of pneumatic tires.

While no fixed relation could be established between the rolling resistance and profile of road surfaces, it was readily shown that for a given vehicle and type of road surface the resistance increases with the roughness. Speed and the suspension system of the vehicle as well as the degree of rigidity of the road surface and the nature of the unevenness all enter into the problem. It was shown quite conclusively that under identical conditions the rolling resistance of solid tires is from 6 to 10 lbs. per ton higher than for pneumatic tires. This relation was less readily established on gravel and earth roads than on paved surfaces.

The rolling resistance was much lower on clean, dry, hard surfaces than on surfaces covered with snow, even a thin layer of fairly well compacted snow resulting in a decided increase in the rolling resistance. It was shown conclusively that the rolling resistance of sheet asphalt pavements increases materially with an increase in temperature, and that the rolling resistance of the coarse aggregate type of asphaltic concrete increases somewhat with an increase in temperature.

Studies of relative fuel consumption on different types of road surfaces showed that the best results were obtained on concrete and the best gravel roads.

The highway engineer's year book for 1924, edited by H. G. Whyatt (*London and New York: Isaac Pitman & Sons, Ltd., 1923, pp. XVI+238, figs. 111*).—This is the first issue of this yearbook, which is intended to cover the highway engineering and construction industry in Great Britain and deals with the outstanding problems now being considered. It contains chapters on rock asphalt and bituminous roads; tar, tar painting, bitumen, and bitumen painting; proprietary tarry, bituminous, or alternative materials; machinery for mixing or applying tarry or bituminous materials, and for afterwards gritting; road rollers and scarifiers; road stone and stone breakers; concrete roads; concrete mixers, layers, and breakers; reinforcement metal; rubber roads; street sweeping, watering, cleansing, and gritting; gullies and gully cleaners; motor wagons—electric, petrol, and steam; and miscellaneous appliances. A classified directory of manufacturers is included.

Public Roads, [July, 1924] (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 5, pp. 26, figs. 22*).—This number of this periodical contains the usual data on road material tests and inspection news and status of Federal-aid highway construction as of June 30, 1924, together with the following articles: Transportation of Milk by Motor Truck, by H. R. Trumbower (see p. 892); Friction Tests of Concrete on Various Sub-bases, by A. T. Goldbeck (see p. 887); and The Bulking of Moist Sands: Effect of Phenomenon on Strength and Yield of Concrete, by A. A. Levison (see p. 886).

Fuel saving devices and treatments for internal combustion engines (*Nebraska Sta. Rpt. [1923], p. 8*).—Tests of a number of representative fuel treating materials showed that the same results can be secured by proper adjustment of the carburetor without fuel savers as when these are used. Gasoline improvers did not in general give a marked saving in fuel nor increase the mileage per gallon. When any improvement was noted it was so slight that it did not pay for the added cost of the improver.

Hygrometry of buildings [trans. title], M. A. Knapen (*Recherches et Invent., Off. Natl. Recherches Sci. et Indus. et Invent., Min. Instr. Pub. [France], 4 (1923), No. 77, pp. 857–869, figs. 4*).—The nature of the occurrence and movement of moisture and dampness in the walls of buildings is discussed, with particular reference to the development of means for their prevention.

Portable hog houses, C. M. HUBBARD (*Wash. State Col. Ext. [Bul.] 117 (1924), pp. 7, figs. 3*).—Information, drawings, and bills of material for the construction of portable hog houses adapted to conditions in the State of Washington are presented.

Poultry houses and equipment (*Ohio Agr. Col. Ext. Bul., 19 [1924], No. 7, pp. 40, figs. 51*).—Working drawings and quantity surveys of materials of three laying houses and their equipment and one brooder house adapted to poultry raising conditions in Ohio are presented in this bulletin.

Why build a silo and how, J. C. WOOLEY, E. A. TROWBRIDGE, and A. C. RAGSDALE (*Missouri Sta. Bul. 214 (1924), pp. 16, figs. 13*).—The advantages of a silo under the practical conditions to be met on Missouri farms are briefly stated, together with definite building instructions for each type of silo.

The trench silo and ensilage, J. E. DONKIN and E. J. VAN MEERTEN (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 4, pp. 367–369, fig. 1*).—Information on the construction and filling of trench silos is briefly presented.

Simple water systems, O. E. ROBEY (*Michigan Sta. Circ. 64 (1924), pp. 16, figs. 18*).—Information on simple water systems which may be installed in farm homes without furnace heat is presented.

Electrical house pumping systems, G. C. BLALOCK and D. D. EWING (*Purdue Univ., Engin. Ext. Serv. Bul. 4 (1923), pp. 30, figs. 6*).—The object of this publication is to present pertinent information concerning the various electric motor driven water supply systems now on the market in such a manner as to permit their intelligent selection and application, particularly for farm conditions. Information on operation is also included. Data from operating records and tests of several systems are appended.

Sanitation and water purification, J. H. JOHNSTON (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 8 (1923), pp. 505–517*).—A review is presented of the noteworthy advances in the technique of sewage and water purification during the past year.

Elements of water bacteriology with special reference to sanitary water analysis, S. C. PRESCOTT and C. E. A. WINSLOW (*New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1924, 4. ed., rewritten, pp. IX+211, fig 1*).—This is the fourth edition of this book (E. S. R., 29, p. 814).

Farm home fire prevention, H. SYKES (*Wash. State Col. Ext. [Bul.] 114 (1924), pp. 11, figs. 7*).—Practical information on the prevention of fires in farm homes is presented.

Grain fire prevention, H. SYKES and G. L. ZUNDEL (*Wash. State Col. Ext. [Bul.] 115 (1924), pp. 8, figs. 6*).—Practical information on the prevention of grain fires is presented, special reference being made to smut dust explosions.

RURAL ECONOMICS AND SOCIOLOGY.

[Investigations in farm management and marketing at the North Dakota Station, 1921–22 and 1922–23] (*North Dakota Sta. Bul. 174 (1924), pp. 54–60, figs. 2*).—A report is given on a number of projects.

Farm management, R. E. Willard (pp. 54–57).—Studies principally of the cost of production of crops and livestock are noted. The capacity, cash cost, total cost, and cost per ton of capacity of constructing pit silos on 10 farms in Morton County are tabulated. Wheat yields are tabulated by counties of the State in percentages of the best crop produced in each county. Causes of crop loss are cited.

Marketing and rural finance, A. H. Benton (pp. 57–60).—The procedure followed in studying the potato marketing problem is outlined, together with some of the results secured.

Investigations with reference to agricultural business management [trans. title], O. H. Larsen (*Landøkonom. Driftsbur.* [*Denmark*], *Undersøg. Landbr. Driftsforh., No. 6* (*1923*), *pp. 190; rev. in Jour. Min. Agr.* [*Gt. Brit.*], *31* (*1924*), *No. 1, pp. 23–29*).—This is the sixth of a series of annual reports based upon farm accounts kept by cooperative bookkeeping circles and presents data for 1921–22 along lines noted in the earlier one (E. S. R., 49, p. 89). The gross income from agriculture is shown to have been reduced by 30 per cent in comparison with that of the crop year 1920–21. This is attributed largely to declining prices of agricultural products, particularly livestock products, during the last six months of the business year and to local poor crops. For farms of less than 10 hectares (24.7 acres), where the livestock products made 83 per cent of the total gross output, the income is reduced by 37.4 per cent, while that of the farms of 100 hectares and more, where one-half of the income is derived from the crop, is reduced by 27.3 per cent.

Working costs were reduced, the decrease for the items of wages, goods purchased, and other costs being, respectively, 16, 17, and 12 per cent, while the total reduction amounted to 16 per cent. The net proceeds in 1921–22 amounted to 33 crowns per hectare ($3.58 per acre) as against 236 crowns the year before.

Farming the logged-off uplands in western Washington, E. R. Johnson and E. D. Strait (*U. S. Dept. Agr. Bul. 1236* (*1924*), *pp. 36, figs. 11*).—A detailed study of farms established on logged-off land in King and Pierce Counties, Wash., was made in 1915 and again in 1921, enumerators visiting about 300 farmers in 1915 and 400 in 1921. The territory surveyed was confined to the uplands of the two counties. A complete record of the business of 157 farms for 1915 and of 150 farms for 1921 was obtained from their operators.

It was found that in most cases the selling price of raw logged-off uplands plus the cost of clearing exceeded the value of the land after it was cleared for crops.

The proportion of settlers who had accumulated wealth to the extent of more than $6,000 between the time of settlement and 1921 is as follows: 86 per cent of those who settled before 1898, 78 per cent of those who settled between 1898 and 1903, 61 per cent of the 1904 to 1909 settlers, 26 per cent of the 1910 to 1915 groups, and 5 per cent of those who settled during the six years previous to 1921.

Poultry was the most important enterprise on the farms visited in 1921, an average of 45 per cent of the total receipts being derived from poultry and eggs, 26 per cent from dairy products, and 15 per cent from fruit. Forty-eight per cent of the fruit farms, 44 per cent of the poultry, 22 per cent of the mixed, and 16 per cent of the dairy farms had farm incomes of $500 or over. The average farm income was $414, the food, shelter, and fuel furnished to the family by the farm amounting to $316 in addition.

Feed was the largest item of cash expense in 1921. Unpaid family labor amounting to $166 was included in the expenses in obtaining the farm incomes.

An analysis of the business of each of 47 representative farms operated by the same men through a period of years was made to show the changes which may have taken place. No rapid expansion in size of the farm business is noted except for the poultry farms.

Farm tenants and owners on a corporate estate, W. H. Baumgartel and C. L. Stewart (*U. S. Dept. Agr., Bur. Agr. Econ., 1924, pp. 20*).—A preliminary report in two parts presents information gathered from a field study made in

1919–20 in Amenia and Chaffee Townships, Cass County, N. Dak. The social and economic experiences of 64 tenants operating farms belonging to the Amenia and Sharon Land Co., noted by Benton (E. S. R., 51, p. 595), are set forth, as well as the experiences and the economic status of farm owners holding stock in the company.

[Report of the] department of farm management (*Indiana Sta. Rpt. 1923, pp. 31–33, figs. 2*).—Studies of the costs of fattening cattle and of producing pork are briefly noted.

[Cost of producing crops on demonstration areas at the Louisiana Stations, 1923], S. Stewart (*Louisiana Stas. Rpt. 1923, pp. 42–44*).—The expenditures on corn in combination with velvet beans and cowpeas and on cotton grown in four plats are tabulated here without consideration of the items of taxes, interest on investment, depreciation, and overhead.

Corn planted with cowpeas and beans, which, however, matured nothing and were not harvested, yielded 15.74 bu. per acre on about 9 acres at a total cost for preparation and planting, fertilizer, seed (corn, beans, and peas), cultivation of crop, and harvesting of $12.89 per acre. Corn on a 3-acre plat planted May 15 and given very little attention yielded 11 bu. per acre at a total cost of $17.14 per acre. Corn planted with velvet beans on about 11 acres previously planted to cotton yielded 18.36 bu. per acre at a total cost of $14.86 per acre. The value of the corn crop at $1 per bushel was therefore $3.50 per acre above cost. The net value of the corn crop and the beans picked on approximately ⅜ acre is estimated at $12.88 per acre above the cost of production. Cotton following corn and cowpeas on 17 acres yielded a crop valued at $1,207.80, the total cost of which was $611.77.

Employment hours and earnings in prosperity and depression, United States, 1920–1922, W. I. King (*New York: Natl. Bur. Econ. Research, Inc., 1923, pp. 147, figs. 11*).—An investigation was carried on for the President's Conference on Unemployment by the U. S. Bureau of the Census and the National Bureau of Economic Research, with the cooperation of the Bureau of Agricultural Economics, U. S. D. A. Questionnaires were distributed to the township crop reporters by the Bureau of Agricultural Economics, and about 8,500 schedules were received. The occupations followed during the last two years by members of the farmer's family and the number of employees hired by each farmer, the hours they worked, and the wages they received were asked for.

This report embodies the results of the whole inquiry into the subject of unemployment in the United States in all industrial fields, and is presented in chapters dealing with the number of employees, the volume of employment, and hours worked per week and earnings of employees. The data setting forth these phases of the farm labor problem are tabulated and reviewed in each chapter. The returns comprise an approximately complete record of the seasonal changes occurring in the conditions of agricultural labor and a picture of the distribution of farm employees according to hours and earnings.

The importance and advantages of a good system of agricultural credit: The example of the United States [trans. title], J. R. Rousso (*Égypte Contemporaine, 15 (1924), No. 78, pp. 246–258*).—This article describes the rural credits systems of the United States, setting forth the organization and operation of the Federal land banks and associated bodies, as well as the intermediate credit banks authorized by law in 1923.

The taxation of the profits of agriculture in Belgium [trans. title], M. L. Gerard (*Rev. Écon. Internatl., 16 (1924), II, No. 1, pp. 38–70*).—A résumé is given of outstanding opinions with respect to debated phases of the income tax upon agriculture, together with a commentary upon the Belgian law of

1919 and the conclusions of the National Commission for Agricultural Production. The income taxes paid from large and small holdings are compared, showing that the large holdings normally pay more per hectare than the small ones. The questions of the inclusion of the salary of the operator and the income on invested capital are discussed, together with the rate of personal income in agriculture and the taxable capacity of Belgian agriculture in particular.

Production and marketing of wheat in North America, J. F. Booth (*Sci. Agr., 4 (1924), No. 10, pp. 293–300*).—A historical discussion is presented under the captions of early history of wheat in America, the industrial revolution and westward expansion, and the development of railroads and of grain exchanges.

Cotton futures, F. de P. González Palou (*Futuros de Algodón. Barcelona: Editorial Cultura, 1924, pp. 306, pls. 13, figs. 3*).—This is said to be the first study of cotton and cotton marketing to be prepared for Spanish readers. It sets forth the cultivation of cotton, the operation of cotton markets, factors contributing to fluctuations in prices of cotton, and the mechanism of future trading. A detailed account is given of methods of growing cotton in the United States, Federal provisions for crop reporting, and regulations as to selling. The world's important cotton exchanges are described. Appendixes present a table for the reduction of English and American money into Spanish money and formulas and tabulated data for calculating prices of spinning cotton.

Marketing cabbage, A. E. Cance and G. B. Fiske (*U. S. Dept. Agr. Bul. 1242 (1924), pp. 60, figs. 31*).—Cabbage is said to rank third among the vegetables in commercial output, being exceeded only by potatoes and tomatoes. This bulletin describes the commercial production, showing the principal growing regions and methods of growing, and discussing problems of financing, harvesting, packing, shipping, storage, marketing, and prices. Maps and other graphic illustrations are used in setting forth the growing regions, the destination of shipments, prices, the distribution of the consumer's dollar, and other data.

Transportation of milk by motor truck, H. R. Trumbower (*U. S. Dept. Agr., Public Roads, 5 (1924), No. 5, pp. 1–18, figs. 14*).—A survey and investigation of the transportation of milk by motor truck were made in Baltimore, Philadelphia, Cincinnati, Detroit, Milwaukee, St. Paul, Minneapolis, and Indianapolis in 1923, intended to determine the extent to which the motor truck is used in bringing milk into the cities over the highways.

For the eight cities studied a total of 683 motor trucks was engaged in the transportation of milk; 65.6 per cent of these trucks operated within the 0–29 mile zone, 27.6 per cent in the 30–49 mile zone, and the rest traveled routes 50 miles and over in length. A large part of this movement is over comparatively short distances. The motor trucks engaged in this business are for the most part of the smaller capacity type. The 1- to 2-ton trucks constitute 57.1 per cent of the total number, and the trucks over 4-ton capacity amount to only 7.3 per cent. Detroit is the only city which shows a very large development in the use of the tank truck.

For distances from 30 to 39 miles the motor truck rate ranges from 35 to 40 cts. per 100 lbs. or the equivalent of about 20 cts. per ton-mile. For shorter distances the rate is higher. It is the uniform practice for the rate charged to include the return movement of empty cans. Where railroad rates were compared with motor truck rates it was usually found that the motor truck rates were the same as the railroad rates or somewhat higher. Even though the truck rates are higher the tendency is to ship by motor trucks where the distances are not too great for trucks to operate. Use of the motor truck in shipping milk eliminates the city terminal transportation costs which have to be met where shipments are made by railroad.

Cooperative transportation organizations have not been developed to any great extent in the areas surrounding cities studied in this investigation. The only motor trucks operated by farmers upon a cooperative basis were found in the Baltimore area, where several organizations of this kind have entered this field and made a success of it.

Co-operative livestock shipping, W. WALDRON (*Saskatchewan Dept. Agr. Bul. 74 (1923), pp. 31, figs. 4*).—This bulletin supersedes one noted earlier (E. S. R., 33, p. 491), using much of the same material but with revisions and deletions.

Cooperative livestock marketing in Ohio, B. A. WALLACE (*Ohio Sta. Bul. 375 (1924), pp. 33–82, figs. 4*).—The history of livestock shipping in Ohio is outlined, and the details of operation; particularly on the county-wide plan, are presented on the basis of information taken from monthly reports furnished through the farm bureau as well as from replies to a questionnaire returned by the managers of 45 of the 61 companies in the State and detailed data assembled by the station in cooperation with the Bureau of Agricultural Economics, U. S. D. A.; also 50 or more annual or semiannual audits of livestock companies are analyzed. Instructions are offered as to how livestock should be sold, and certain features of a comprehensive scheme of livestock marketing are outlined. Appendixes give, respectively, certain arguments advanced for the organization of livestock shipping on the county-wide plan, legislation providing for organizations of producers, a form for the code of regulations for a livestock cooperative association, and a type of marketing agreement.

Crops and Markets, [August, 1924] (*U. S. Dept. Agr., Crops and Markets, 2 (1924), Nos. 5, pp. 65–80; 6, pp. 81–96; 7, pp. 97–112, fig. 1; 8, pp. 113–128; 9, pp. 129–144*).—The usual weekly abstracts and reviews of market reports are given, together with tabulated data with reference to the receipts and prices of important agricultural commodities at the principal markets.

Report of the committee on an agricultural program, November 20, 1923, E. P. COHILL (*[College Park]: Md. Univ. Ext. Serv., 1923, pp. 62*).—The committee appointed by the Governor of Maryland, May 15, 1923, presents a summary of its recommendations in behalf of the agriculture of the State.

Where are we going? C. TURNOR and B. GILBERT (*London: Cecil Palmer, 1923, pp. 90*).—A plea is presented for the combination of the rural vote of Great Britain into a rural party for the protection of agricultural interests.

The ills of French agriculture [trans. title], M. LAIR (*Rev. Écon. Internatl., 16 (1924), II, No. 1, pp. 7–37*).—Comparisons are drawn between the production of the principal crops in the period just preceding the war and that of recent years, showing that production is gradually tending to approach the pre-war level and self-sufficiency. Exports are shown to be increasing. The apparent increase in the prices of agricultural products is attributed largely to the low exchange, and the producers' profits are said to have increased only a very little. The scarcity of farm labor is deplored, and the advantages of alleviating the social and economic ills of country life and of influencing an increase in the birth rate in rural districts principally by assuring the perpetuity of inheritance are pointed out.

Sociological significance of recent rural religious surveys, E. DES. BRUNNER (*Amer. Jour. Sociol., 29 (1923), No. 3, pp. 325–337*).—Outstanding facts are cited from the results of the series of rural religious surveys previously noted (E. S. R., 48, p. 493) and from time to time since. It is noted that good feeling between town and country was found in about two cases out of three; and that this good feeling was evidenced by the spread of the consolidated school movement, the teaching of agriculture in schools, the founding of rural hospitals, the presence of farmers on the town and village boards of trade, and in other ways. It was deemed advisable to expand the community concept to include with the trade or service areas of a town or village certain variants from this type. It was shown that the question as to whether or not the town and village churches are growing at the expense of the country church can not be answered in any general way.

For the purpose of these surveys a method was worked out for more or less precisely measuring the comparative efficiency of rural religious agencies. The most concrete available units for such measurements were taken as expressed in terms of time, material (including money), and man power. One aim of the investigations was to measure churches by the per capita amount of time each of the members devoted to its activities. Attendance was taken to mean the usual number of persons attending each type of service multiplied by the number of services per month. This concept was called "units of attendance interest." It is thought that by this method one individual church can be compared with another, the church interest of a county or region can be set over against that of another section, and church life of the present can be weighed and compared with that of previous decades. It has been found that within certain comparable communities in churches having 50 active members or more the average per capita investment of time on the part of each member runs between 2.25 and 2.9 units or hours per month. In the smaller churches the service interest is higher. A study of the 40 most successful town and country churches found in America shows that these churches command from 5.25 to 12 hours from each member per month.

Further, an attempt was made to divide this per capita investment of time between worship, religious education, and social or community service. The results in this case, however, are still practically unformulated. It is pointed out here that the Middle West as a section leads in contribution of both time and money, that the irrigated sections of California are second in money and practically tie with the Northern Colonial States in contribution of time, and that the South is fourth and the far West fifth in time and money. The per capita range is between 2.03 hours per month and 0.9. In money on the yearly basis, the range is from $1.95 to $5.47.

The average value of farms of any given county was compared with the per capita contributions of the country church, and a tendency was discovered for the per capita contribution of church members to equal 0.1 per cent of the value of the farm.

In another respect there was found to be a very close relationship between the growth and decline of churches and the rise or fall of population.

Rural religious organization, J. H. Kolb and C. J. Bornman (*Wisconsin Sta. Research Bul. 60 (1924), pp. 63, figs. 20*).—The purpose of this study is to determine the facts and conditions of the organization of religious groups found in Dane County, Wis. Personal visits were made to every church parish in the county outside of the city of Madison. Parishes were mapped and local histories and other information were collected. The major religious groupings were found to be the Lutheran, the Roman Catholic, and the Reformed. Three streams of settlement from Europe and the Eastern States were defined, corresponding to these divisions.

A tendency toward a merging of the group identities is pointed out. The number of religious bodies has been reduced since 1890, and there has been a marked growth of the Lutheran and the Roman Catholic organizations.

There was found to be a rough sort of correspondence between the parish boundaries of churches located in villages and small towns and the trade areas of these various centers. There was a large number of large country churches, and churches located in some center were as successful in reaching the farmer as were those in the open country. The largest number of small churches was among those of the Reformed bodies, and none of these had a membership larger than 200. Their churches were situated in centers of population. The most frequent size of the Lutheran churches lay between 201 and 250 members, and over half of these, as well as of the Roman Catholic churches, had over 200 members. The total number of pastors serving churches in the county was 80, of whom 70 reside in the county and 64 are resident pastors. The problems of abandoned churches, overlapping parishes, unchurched territory, nonresident clergy, and nationality and language factors are discussed.

Examples of community enterprises in Louisiana, A. W. Hayes (*Tulane Univ. La., Dept. Sociol., Research Bul. 3 (1923), pp. 48, figs. 22*).—This study was carried on at Tulane University with the cooperation of the Bureau of Agricultural Economics, U. S. D. A., in order to complete a study noted earlier (E. S. R., 48, p. 892). Several examples of community enterprises are described.

Model rules for an agricultural society (*Edinburgh: Bd. Agr. Scotland, 1924, pp. 22*).—A copy of suggestive rules approved by the Board of Agriculture for Scotland under the Agricultural Credits Act, 1923, and the Industrial and Provident Societies Acts, 1893 to 1913, is given.

Directory of agricultural organizations and institutions, 1924, compiled by W. I. Drummond (*Kansas City, Mo.: Internatl. Farm Cong. Amer., 1924, pp. 47*).—National and local agricultural associations in the United States are listed and described, together with a number of Canadian associations. The official rosters are given, corrected up to March, 1924.

Monthly Supplement to Crops and Markets, [August, 1924] (*U. S. Dept. Agr., Crops and Markets, 1 (1924), Sup. 8, pp. 249–288, figs. 7*).—Current estimates of acreage and yields of important crops, including truck crops, are offered with comparisons with earlier years and periods of years; and crop conditions, August 1, 1924, farm prices, the livestock and meat situation and the receipts and disposition of livestock at important markets, cold storage holdings, shipments of fruits and vegetables, grain receipts, and other data are tabulated. One special report compares farm prices and retail prices of seven articles on June 15, 1913 to 1924, inclusive. Two special articles may be noted, one presenting a new series of index numbers constructed in the Department, composed of prices of 30 commodities classified in six groups. The other article summarizes in four tables and discusses the results of a study of agricultural income for the United States for the 5-year period 1919–20 to 1923–24.

Maryland farm statistics, J. S. Dennee (*Md. Univ. [Agr.] Ext. Bul. 32 (1924), pp. 43, pl. 1, figs. 3*).—The statistics given in these pages are largely estimates based upon information received from voluntary crop correspondents, and are presented cooperatively by the Bureau of Agricultural Economics, U. S. D. A., and the University of Maryland Extension Service.

Agriculture and livestock in Sweden, 1921 [and 1922] [trans. title], L. Widell (*[Sweden] K. Statis. Centralbyrån, Sveriges Off. Statis., Jordbr. och Boskapsskötsel, 1921, pp. VII+61; 1922, pp. VII+61*).—Statistics are presented with interpretative discussion along the lines previously noted (E. S. R., 50, p. 296).

Land tenure and settlement, [agriculture, pastoral production, and forests in Australia], C. H. Wickens (*Aust. Off. Yearbook, No. 16 (1923),* *pp. 150-217, 686-784, figs. 6*).—Information for the later year is presented along the lines previously noted (E. S. R., 48, p. 894).

Crops and fruits, J. R. AINSWORTH-DAVIS (*London: Ernest Benn, Ltd., 1924, pp. XVII+19-144*).—The Resources of the Empire Series in 12 volumes has for its purpose the furnishing of a business man's guide and work of reference on the available supplies of raw materials in the British Empire and the summarizing of the present condition of interimperial trade. The 12 volumes are food supplies, in two parts, of which this is the first; timber and timber products; textile fibers and yarns; fuel; rubber, tea, cacao, and tobacco; leather; chemicals; ferrous metals; nonferrous metals; oils, fats, waxes, and resins; and communications. Each contains a foreword by the Prince of Wales and a general introduction by E. Geddes.

The introductory review to this work on crops and fruits is written by S. Machin. Data are presented in three sections dealing with chief foods of vegetable origin; production, import, and export of food of vegetable origin in the British Empire and the Kingdom of Egypt; and summary and conclusions.

Meat, fish, and dairy produce, J. R. AINSWORTH-DAVIS (*London: Ernest Benn, Ltd., 1924, pp. VII+9-104*).—This is part 2 of the work noted above. It includes the summary and general conclusions, together with an extensive bibliography. The introductory review is by G. Campbell.

Timber and timber products, edited by S. J. DULY (*London: Ernest Benn, Ltd., 1924, pp. 228*).—This volume belongs to the series noted above. It contains an introductory review by Lord Lovat and a statistical presentation of the extent and nature of the Empire's forests by dominions, colonies, and protectorates.

Rubber, tea, and cacao, compiled by W. A. MACLAREN (*London: Ernest Benn, Ltd., 1924, pp. 334, figs. 6*).—The introductory review to this one of the series noted above is by H. E. Miller. The study consists of detailed geographical surveys of the raw rubber industries of the British Empire, with special sections on coffee, spices, and tobacco.

AGRICULTURAL EDUCATION.

The educational work of the Department of Agriculture, C. W. WARBURTON (*School and Soc., 20 (1924), No. 507, pp. 332-336*).—This paper describes this work of the U. S. Department of Agriculture under three main divisions of research, resident teaching, and extension.

Agricultural education [in Northern Ireland] (*North. Ireland Min. Agr. Ann. Gen. Rpt., 2 (1922-23), pp. 6-13*).—Notes with reference to progress are presented as in the earlier report (E. S. R., 50, p. 694).

The value of two-year higher courses in agriculture [trans. title], E. LEPLAE (*Rev. Gén. Agron., n. ser., 14 (1924), No. 2, pp. 62-93*).—Two 2-year programs in agriculture, one offered in German higher institutions and universities and the other that followed at Louvain for the degree in agronomy, are cited. The organization of such courses, with short courses also in tropical agriculture for training agriculturists for the colonies, is urged for Belgium. The systems in vogue in Germany, France, and England are set forth, completely noting the courses offered, the manner in giving examinations, and other details.

The agricultural economic trend, C. L. STEWART (*Vocat. Ed. Mag., 2 (1924), No. 10, pp. 809-816*).—Certain phases of the economic function of the American farmer are reviewed in order to point out those on which emphasis should be placed in vocational training in agriculture. It is held first that in training farm hands for efficiency it is wise to train them in the principles of farm management and marketing and develop the national or social viewpoint. This ought not only to help them become better farm hands but also to determine more wisely whether they will remain laborers and whether they will want to remain farmers. In the second place, economic training should be given which will encourage the application of principles of better management, saving, and investment. Also, the farmer must be taught to use his credit facilities, and in the fourth place he must be brought to a broader understanding of salient market facts and world economic movements.

The effectiveness of vocational education in agriculture, T. L. Bayne, jr. (*Vocat. Ed. Mag., 2 (1924), No. 10, pp. 818–821*).—A study previously noted (E. S. R., 51, p. 693) is reviewed, the reviewer taking exception to the conclusion that vocational instruction in agriculture appears to be responsible for reducing the mortality of high school students by 63.5 per cent and to the statement that this conclusion is supported by data from the New York State Rural School Survey (E. S. R., 48, p. 793). Some of the original data sheets from that survey, in which the enrollment of the students in vocational agriculture was reported separately, were furnished the reviewer, and data therefrom are interpreted in this paper.

The teaching job in vocational agriculture, B. E. Barringer (*Jour. Rural Ed., 3 (1924), No. 9–10, pp. 406–413*).—This article is designated as an analysis of the duties of the teacher of vocational agriculture as the source of training objectives in preparing teachers. It emphasizes the need of providing the prospective teacher with appropriate farm skills and points out some of the difficulties of the teaching job, such as the endless variety of details, the dynamic condition of farm science, the lack of standardization in courses of study, the range of types of teaching technique, the necessity for teaching outside of the classroom and for individual teaching, and the difficulties of adequate supervision.

Suggestions on curriculum making for the Middle West, H. M. Hamlin (*Vocat. Ed. Mag., 2 (1924), No. 10, pp. 816–818*).—It is held that the Iowa farmer needs to know how to grow and market hogs, cattle, poultry, corn, oats, and clover. Instruction along these lines, together with some attention to horse husbandry, to home gardening and orcharding, and to farm engineering and farm management, constitutes the logical curriculum for the boy who is to farm in this section.

Farm home and social experiences of farm boys, C. R. Wiseman (*Vocat. Ed. Mag., 2 (1924), No. 10, pp. 806–808*).—The author studied the farm home and other social experiences of pupils of vocational agriculture in South Dakota, and in this paper he endeavors to show how the facts may be applied to the teaching content and the method of presentation of courses in vocational agriculture. The total amount of farm experience and that of the summer just preceding the time of the study, the ownership of livestock or crops in the preceding three years, and the purebred livestock and pure seed grains found on the home farms were revealed. Suggestions as to the curriculum are based upon these items.

Principles of supervision, F. Kelley (*Vocat. Ed. Mag., 2 (1924), No. 10, pp. 840–843*).—This is a general discussion of principles of supervision as they apply to home economics teaching in a city system. The job of supervisors is analyzed under the heads of the duties of adminstration and of supervision.

Lessons in forest protection, G. H. Wirt (*Penn. Dept. Forests and Waters Bul. 35 (1924), pp. 37*).—Eighteen short lessons covering the destructiveness of forest fires and some means of their prevention are presented.

Cooperative extension work, 1922 (*U. S. Dept. Agr., Coop. Ext. Work, 1922, pp. II+36*).—This is the eighth annual report on cooperative extension work in agriculture and home economics and follows the general lines of the earlier one (E. S. R., 49, p. 494).

MISCELLANEOUS.

Work and progress of the [Idaho] Agricultural Experiment Station for the year ended December 31, 1923, [E. J. IDDINGS] (*Idaho Sta. Bul. 133 (1924), pp. 19*).—This contains the organization list, a report of the director, and financial statements for the Federal funds for the fiscal year ended June 30, 1923, and for the remaining funds for the fiscal year ended December 31, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report of [Indiana Station], 1923, G. I. CHRISTIE and H. J. REED (*Indiana Sta. Rpt. 1923, pp. 79, figs. 29*).—This contains the organization list, a report of the director summarizing the activities of the station, publications of the year, changes in staff, etc., and a financial statement for the Federal funds for the fiscal year ended June 30, 1923, and for the remaining funds for the fiscal year ended September 30, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-fifth Annual Report of the Kentucky Agricultural Experiment Station for the year 1922, Part II (*Kentucky Sta. Rpt. 1922, pt. 2, pp. IV+378+93, figs. 104*).—This contains reprints of Bulletins 239–245 and of Circulars 28–30, all of which have been previously noted.

Thirty-fifth Annual Report of [Louisiana Stations], 1923, W. R. DODSON ET AL. (*Louisiana Stas. Rpt. 1923, pp. 61*).—This contains the organization list, a financial statement for the fiscal year ended December 31, 1923, and a report by the director, including brief departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report of [Nebraska Station, 1923], E. A. BURNETT and W. W. BURR (*Nebraska Sta. Rpt. [1923], pp. 43*).—This contains the organization list, a report of the work of the station, and a financial statement for the fiscal year ended June 30, 1923. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Annual Report of [Nevada Station], 1923, [S. B. DOTEN] (*Nevada Sta. Rpt. 1923, pp. 16*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1923, lists of the station projects and publications, and a report of the director discussing the work and problems of the station during the year.

Forty-sixth Annual Report of the North Carolina Agricultural Experiment Station, [1923], B. W. KILGORE ET AL. (*North Carolina Sta. Rpt. 1923, pp. 103, pl. 1, figs. 17*).—This contains the organization list, a report of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1923. The experimental work is for the most part abstracted elsewhere in this issue.

Experiment station progress: Report of director for biennium ending June 30, 1923, P. F. TROWBRIDGE ET AL. (*North Dakota Sta. Bul. 174 (1924), pp. 100, figs. 25*).—This contains the organization list, a report of the director and heads of departments on the work of the station and the various substations, and a financial statement for the biennium ended June 30, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Porto Rico Agricultural Experiment Station, 1923, D. W. MAY ET AL. (*Porto Rico Sta. Rpt. 1923, pp. [2]+18, pls. 4*).—This contains the organization list, a summary by the agronomist in charge as to the general conditions and lines of work conducted at the station during the year, and reports of the assistant chemist, horticulturist, plant breeder, assistants in plant breeding and horticulture, entomologist, plant pathologist, and specialist in farm management. The experimental work reported is for the most part abstracted elsewhere in this issue.

Annual Report of [Porto Rico Insular Station], 1923, R. MENÉNDEZ RAMOS ET AL. (*Porto Rico Dept. Agr. and Labor Sta. Ann. Rpt., 1923, pp. 64; also Spanish ed., pp. 63*).—This contains the organization list, a report by the director for the fiscal year ended June 30, 1923, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Report of the Virgin Islands Agricultural Experiment Station, 1923, J. B. THOMPSON and W. M. PERRY (*Virgin Islands Sta. Rpt. 1923, pp. [2]+13, pls. 3, fig 1*).—This includes the organization list and reports by the agronomist in charge and the horticulturist as to the work of the station for the fiscal year ended June 30, 1923. The experimental work reported is for the most part abstracted elsewhere in this issue.

Bulletin summary (*Massachusetts Sta. Circ. 71 (1924), pp. 4*).—Brief summaries are given of Bulletins 215–218, Control Series Bulletins 23–26, and the report of the station for 1922, all of which have been previously noted. The titles of reprints available from technical articles published in 1923 are also listed.

Monthly Bulletin of the Ohio Agricultural Experiment Station, [May–June, 1924] (*Ohio Sta. Mo. Bul., 9 (1924), No. 5–6, pp. 73–104, figs. 12*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Grazing Farm Woodlots, and Gladiolus Diseases, the latter by F. Detmers.

NOTES.

Kansas College and Station.—A conference with representative flour mill owners and operatives was held at the station October 17 to discuss the proposed remodeling of the college and station mill in order to modernize it and fit it for use in experiments in flour milling technique. During the 12 years that the mill has been in operation it has been used for student instruction and for routine milling tests in connection with wheat improvement. It is now proposed to add to these two lines of work a series of experiments on milling processes. A committee of commercial millers has accepted an invitation to assist in developing plans for the proposed experiments.

The total undergraduate enrollment in agriculture for the first semester is 352. The freshman class is 19 per cent larger than a year ago, but because of reductions in the junior and senior classes the total enrollment is smaller by 7 per cent.

At the request of the division of agriculture, the department of education has given a series of five lectures to the agricultural freshmen on how to study.

During the annual extension conference week at the college in October, the county agents spent two half days studying station projects on poultry nutrition, animal genetics, chinch bug control, taxation, and tree production.

Dr. F. L. Hisaw, for five years in charge of experiments with injurious mammals, has resigned to accept an appointment with the University of Wisconsin and has been succeeded by Dr. George E. Johnson, of the University of Mississippi.

Louisiana Stations.—Dr. Eugene C. Tims has been appointed assistant plant pathologist.

Massachusetts College.—Wilbur H. Thies, instructor in physics in the Michigan College, has been appointed assistant extension professor of pomology.

Michigan College.—New radio equipment has been contributed to the college, including an improved radiophone transmitter valued at $35,000. This gift will materially increase the broadcasting facilities of the institution.

Texas Station.—Substation No. 16, near Iowa Park in Wichita County, provided for by the last legislature, has been officially established and development work has been begun. The people of Wichita County donated to the State a tract of 161 acres of excellent land, together with a permanent water right in a rather large irrigation district. Earl J. Wilson has been appointed superintendent of this substation and has entered upon his duties.

On September 1, the poultry, swine husbandry, and dairy work was separated from the remainder of animal industry. The name of the division of animal industry was changed to that of the division of range animal husbandry, with J. M. Jones continuing as chief of the division. The new divisions as established comprise those of dairy husbandry, swine husbandry, and poultry husbandry, the first two with G. R. Warren as chief and the third in charge of R. M. Sherwood.

C. B. Neblette has been appointed technical assistant, beginning October 1, and will take charge of the station's photographic laboratory.

Washington College Station.—Max A. McCall, superintendent of the substation at Lind, has been appointed agronomist in the U. S. D. A. Office of Cereal Investigations.

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